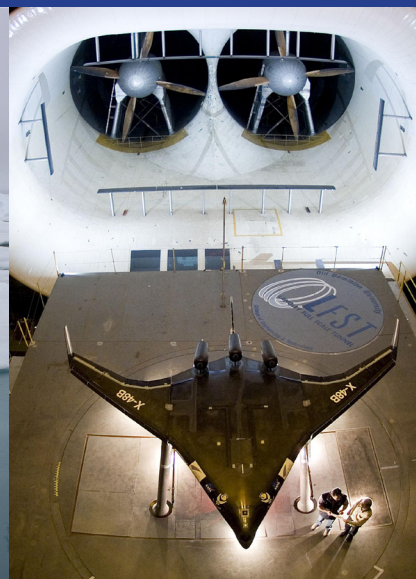
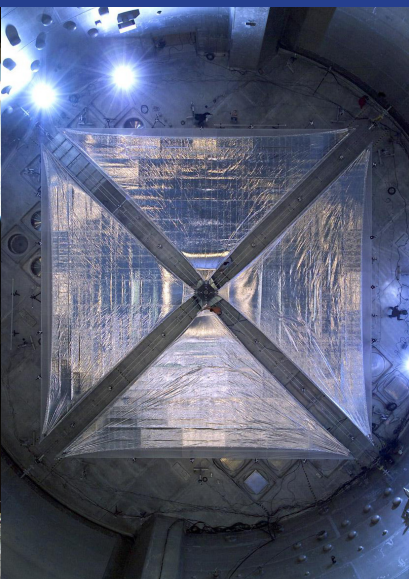


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Section 1: Agency Policy and Strategy

1.1 AGENCY POLICY STATEMENT

Worldwide, people have turned to the National Aeronautics and Space Administration (NASA) for inspiration throughout our history. It is NASA's mission "To drive advances in science, technology, and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of the Earth." NASA is an agency that leads by example and will continue to spur profound changes in our knowledge, culture, and expectations.

NASA's sustainability policy is to execute NASA's mission without compromising our planet's resources so that future generations can meet their needs. Sustainability involves taking action now to enable a future where the environment and living conditions are protected and enhanced. In implementing sustainability practices, NASA manages risks to mission, risks to the environment, and risks to our communities, all optimized within existing resources.

In executing its mission, NASA's sustainability objectives are to:

- increase energy efficiency;
- increase the use of renewable energy;
- measure, report, and reduce NASA's direct and indirect greenhouse gas emissions;
- conserve and protect water resources through efficiency, reuse, and stormwater management;
- eliminate waste, prevent pollution, and increase recycling;
- leverage Agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services;
- design, construct, maintain, and operate high-performance sustainable buildings;
- utilize power management options and reduce the number of Agency data centers;
- support economic growth and livability of the communities where NASA conducts business;
- evaluate Agency climate change risks and vulnerabilities and develop mitigation measures to manage both the short- and long-term effects of climate change on the Agency's mission and operations;
- raise employee awareness and encourage each individual in the NASA community to apply the concepts of sustainability to every aspect of their daily work to achieve these goals;
- maintain compliance with all applicable Federal, state, local or territorial law and regulations related to energy security, a healthy environment, and environmentally-sound operations; and
- comply with internal NASA requirements and agreements with other entities.

The NASA family has demonstrated commitment to meeting sustainability targets and goals through actions. We exceeded the five percent target on renewable energy use for federal agencies in 2010, achieving 6.4 percent for total facility electricity use. Several NASA Centers are building solar arrays to provide electricity to buildings and electric car charging stations - the 3,344 panel solar array at NASA Kennedy Space Center (KSC) is producing approximately 920 kilowatts of power. In the past 12 months, NASA implemented an expanded GHG emission tracking, assessment and reporting program that is critically needed to measure progress toward meeting our reduction targets of 18.3% for Scope 1 and 2 GHG emissions, and 12.6% for Scope 3 GHG emissions by 2020.

In fiscal year 2010, NASA exceeded one million square feet of sustainable facilities through new construction and building rehabilitation. At NASA's Ames Research Center, construction is nearly complete for "Sustainability Base," a new facility that has re-purposed NASA technology designed for closed-loop systems in space. The project is a candidate for the platinum-plus rating by the internationally recognized LEED® green building certification system.

To implement this policy and meet the requirements and targets outlined in this plan, NASA will be practical in the integration of sustainability and sustainable practices. We will look for ways to leverage existing management systems, processes and decision-making, to influence both long-term planning and short-term actions, to enhance and strengthen our ability to perform our mission.



Olga M. Dominguez
NASA Senior Sustainability Officer

1.2 SUSTAINABILITY AND THE AGENCY MISSION

Sustainability concepts and thinking are inherent in NASA's mission, strategic goals, and overarching strategies, as outlined in the 2011 NASA Strategic Plan¹. NASA's mission is to "Drive advances in science, technology and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth." Many of the goals outlined in the 2011 NASA Strategic Plan advance NASA's and other organizations' efforts in furthering sustainability.

NASA's overarching strategies also help it to achieve its mission and support U.S. competitiveness. They enable NASA to become stronger and more resilient, and meet the goals, objectives, and targets outlined in this Strategic Sustainability Performance Plan (SSPP). NASA's 2011 Strategic Plan overarching strategies are to:

- Invest in next-generation technologies and approaches to spur innovation;
- Inspire students to be our future scientists, engineers, explorers, and educators through interactions with NASA's people, missions, research, and facilities;
- Expand partnerships with international, intergovernmental, academic, industrial, and entrepreneurial communities and recognize their role as important contributors of skill and creativity to our missions and for the propagation of our results;
- Commit to environmental stewardship through Earth observation and science, and the development and use of green technologies and capabilities in NASA missions and facilities; and
- Secure the public trust through transparency and accountability in our programmatic and financial management, procurement, and reporting practices.

It could be argued that the relationship between NASA's mission and sustainability has existed for decades. The science and engineering behind the durable solar photovoltaic panels that power our satellites and the International Space Station are also applied to land-based photovoltaic systems that provide clean, renewable sources of energy. Water recycling and purification used in arid areas or areas of the world affected by natural and other disasters is another technological contribution from NASA human space flight mission. Since its very beginning, NASA has used space-based science to help improve life on earth in areas such as weather forecasting, forest fire tracking, natural disasters prediction and monitoring, and resource identification and mapping. One of the most important areas in the broad category of Earth Sciences deals with the observation, measurement, and modeling of climate change. Going forward, NASA will continue to enable society to see, understand, respond to, and manage our ever-changing world.

Challenges

In choosing a highly integrated approach to sustainability the Agency seeks to optimize scarce funding against its objective of a progressively more sustainable NASA. Thus a small positive delta in available funding can make a noticeable impact on the Agency's progress. One important example of this integration is that in addition to striving to achieve its Agency Facilities Strategy of renewing and sustaining needed capabilities with the smallest practical infrastructure, the Agency planned a significant increase in its capital investments plans for facilities that would also help us reduce energy and water consumption, greenhouse gas emissions, and ensure that facilities are resilient to likely impacts of climate change.

Just as a modest positive change in funding would enhance the path toward sustainability, a negative change in funding greatly slows our progress. In response to a very high percentage (over 80%) of its facilities deemed likely unsuitable for meeting NASA's current and future mission requirements, the Agency planned a renewal program it could also leverage against the sustainability agenda summarized in this SSPP. Unfortunately NASA's plan to increase its capital investments is not supportable in the current budget environment, and NASA is scaling back plans to renew, consolidate, and reduce the consequences of our activities on the natural environment. The Agency has only begun to quantify and evaluate the implications of these changes, and expects to revisit its strategies in response. What is clear today is that, given a more-than-50% reduction in facility funding for renewal, there will be further challenges to achieving NASA's SSPP goals.

NASA will continue to utilize the creativity, experience and initiative of its personnel to achieve NASA's mission, integrate sustainability into the NASA work ethic, and enable the Agency to meet goals and targets set forth in this SSPP.

¹ NASA's Strategic Plan is found at www.nasa.gov/pdf/516579main_NASA2011StrategicPlan.pdf.

Table 1 is a new requirement in all 2011 SSPPs and provides a summary of NASA's size and scope of operations.

Table 1. NASA Size and Scope of Operations

Agency Attribute	Unit	Amount
Civil Servants - Agency Total (1)	#	18,490
Land Managed (2)	acres	329,432
Facilities Owned – Buildings (3)	#	2,474
Facilities Owned - Other Structures (3)	#	2,391
Facilities Leased - GSA (4)	#	1
Facilities Leased - Non-GSA	#	18
Facility Gross Square Feet	GSF	44,829,626
Number of Locations in which NASA Operates - Throughout U.S. (5)	#	46
Number of Locations in which NASA Operates - Outside of U.S. (6)	#	13
Fleet Vehicles - Owned	#	958
Fleet Vehicles - Leased	#	2,684
Fleet Vehicles - Exempted (Tactical, Emergency, Etc.)	#	126
Operating Budget - FY 2010	\$M	\$18,724
Contracts Awarded - FY 2010	#	35,488
Contracts Awarded - FY 2010	\$M	\$16,017
Purchased Energy - FY 2010	\$M	\$153
Facility Energy Intensity - Goal Subject	BTU/GSF	187,652
Facility Energy Intensity - Goal Excluded	BTU/GSF	325,327
Facility Water Intensity	Gal/GSF	68
GHG Emissions - Scope 1&2 (Comprehensive) (7)	MMTCO ₂ e	1.356
GHG Emissions - Scope 1&2 (Subject to Agency Scope 1&2 Reduction Target) (7)	MMTCO ₂ e	1.356
GHG Emissions - Scope 3 (Comprehensive) (7)	MMTCO ₂ e	0.171
GHG Emissions - Scope 3 (Subject to Agency Scope 3 Reduction Target) (7)	MMTCO ₂ e	0.171

Notes:

- (1) Full-time permanent, part-time permanent, term appointment, student, and other non-permanent
- (2) Owned, easements, leased, other government owned, and public land.
- (3) Definitions of "Buildings" and "Other Structures" can be found in NPR 8800.15B: Real Estate Management Program, Section 2.3.
- (4) Does not include NASA Headquarters
- (5) Includes antennas and MOBLAS on US-owned territories outside of the continental US
- (6) Includes antennas, MOBLAS and VLBI
- (7) Values represent NASA's updated FY08 Baseline in million metric tons of carbon dioxide equivalents. Details can be found in Section 2, Goals 1 and 2.

1.3 GREENHOUSE GAS REDUCTION GOALS

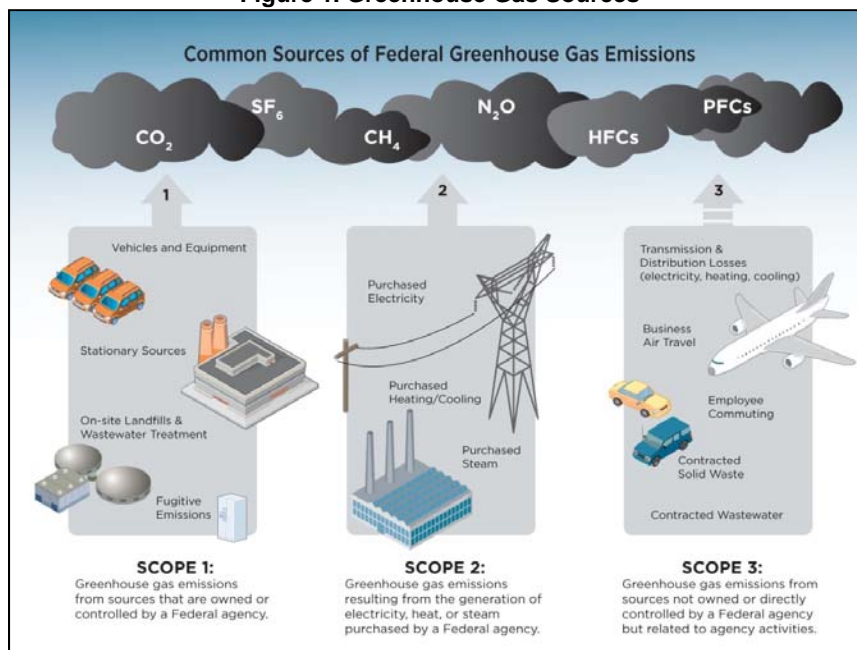
NASA supports its initial commitment to energy reduction and more sustainable infrastructure by continuing to work to achieve the Scope 1 and 2 GHG emission reductions of 18.3% by 2020 from its updated FY 2008 baseline². NASA identified GHG reductions as a significant step toward developing sustainable infrastructure in 2007 when it implemented an internal annual GHG inventory tracking system, based on existing energy and transportation fuel data. In keeping with its commitment, NASA shared its internal GHG inventory tool with the entire Federal family to support the initial interagency efforts to estimate and track GHG emission levels.

NASA also estimated an initial Scope 3 emission target of 12.6% by 2020 from its updated FY 2008 baseline³. NASA plans to achieve this reduction goal through targeted reductions in purchased electricity (to reduce Scope 3 Transmission & Distribution (T&D) losses) and solid waste generation and contracted disposal. This past year NASA implemented an expanded GHG emission tracking, assessment and reporting program in conformance with current guidance to support consistent GHG reporting across all Federal agencies. The 2010 Scope 3 emissions inventory reflects a significant drop in Agency air travel due to unique travel restrictions imposed upon NASA only during FY 2010. Such travel restrictions yielded a substantial drop in projected GHG emissions that reflects unusual circumstances for only that year; travel restrictions imposed in 2010 are not likely to yield ongoing sustainable estimated emission level drops over time. Figure 1 depicts the common sources of GHG emissions. Centers contributed data to establish and update NASA's baselines, annual inventory and emission reduction targets.

² Further details on Scope 1 & 2 GHG emissions reductions can be found in Section 2.1, Goal 1.

³ Further details on Scope 3 GHG emissions reductions can be found in Section 2.1, Goal 2.

Figure 1. Greenhouse Gas Sources



Source: Office of the Federal Environmental Executive; "Scope 3 Greenhouse Gas Emissions" presentation, 3/30/10

NASA GHG emission reduction targets reflect: identified reductions in energy use and intensity; reduced use of fossil fuels and increased use of alternative fuels in fleet vehicles; increased application of green building applications and sustainable design; and innovative energy technologies and funding strategies which promote conservation and renewable energy use.

The Agency uses its internal NASA Environmental Tracking System (NETS) to track Center activities and related data sources to support Agency reporting such as the annual OMB (Office of Management and Budget) Scorecard on Sustainability/Energy. By applying existing Center NETS data, NASA set initial targets for Scope 1 and 2 GHG emissions to mirror required energy intensity reductions and other regulatory and policy requirements.

NASA plans to continue to track emerging GHG and energy requirements and compile the needed data from NASA Centers within NETS. NASA will also leverage related existing data sources. As the GHG requirements evolve and increase, NASA plans to regularly update the NETS system and other data sources to ensure timely access to data for decision making, prioritization, identification of risks and opportunities, reporting, and overall program evaluation. This effort supports development of reliable, stable baselines. NASA's GHG baselines will continue to evolve as expanded or newly defined external requirements are imposed and supporting new guidance becomes available. NASA plans to continue its efforts for coordination and integration among activities related to energy, transportation and GHG management.

1.4 PLAN IMPLEMENTATION

Every NASA employee understands that mission success is a natural consequence of their commitment to the shared core values of safety, integrity, teamwork, and excellence. Our daily actions – which promote environmentally-sound missions and the health of the planet – align with these shared values and enhance our ability to achieve yet to be imagined missions in the future.

1.4.1 Internal and External Coordination and Communication

NASA already possesses a sound foundation for achieving NASA's sustainability goals, requirements, and targets through numerous projects and efforts, some of which have been in operation for years, and many of these fall under the umbrella of 'sustainable practices.' In the coming years, NASA will continue to emphasize sustainability principles in its decision-making processes. Utilizing existing and some newly formed teams greatly aids the endeavor, and several of these communities and practices are described below. Activities and efforts related to 'external' communication are addressed within Section 1.6.

1.4.1.1 NASA Environmental Management System

NASA Policy Directive (NPD) 8500.1B, NASA Environmental Management, requires that NASA maintain an Environmental Management System (EMS) at all appropriate organizational levels and incorporate sustainable practices to the extent practicable throughout its programs, projects and activities. NASA Procedural Requirement (NPR) 8553.1B, NASA Environmental Management System, is the procedural document that implements the NPD and establishes internal requirements for an EMS at all NASA Centers and NASA Headquarters (HQ). The NPR requires the consideration of sustainable practices and an annual review and update of the EMS. NASA has implemented EMSs at all appropriate organizational levels and is currently maintaining the EMSs as required.

The goals established by Executive Order (EO) or included in NASA's SSPP, are captured during the EMS process since they are considered "Legal or Other Requirements." NASA has noted that when identifying aspects and impacts, areas or goals outlined by EO 13514 (and prior EOs) are often identified as high priority aspects and fall within a sustainability-related category. EMS helps to assess the potential impacts, benefits, and associated risks of its activities on mission accomplishment, environmental stewardship, and community support. For those aspects and impacts deemed high priority aspects, the EMS process requires establishment of objectives, targets, and programs to address the aspect and meet goals that are established by internal or external requirements for that aspect. The SSPP goals and any associated EMS objectives and targets are reviewed at least annually by senior management to determine whether they are being met and whether a change in EMS priority status is necessary.

To ensure Center EMSs are maintained, the NASA HQ Environmental Management Division (EMD) conducts an external Environmental & Energy Functional Review (EEFR) that includes an EMS audit and compliance audit of each Center every three years. In addition, NASA's Senior Sustainability Officer (SSO) conducts an annual review of the status of NASA EMSs during the HQ EMS Management Review and submittal of the annual EMS report.

1.4.1.2 General Rules for Effective and Efficient Integration

Sustainability activities and efforts need to be performed in a manner that is practical, efficient, and effective.

To facilitate the integration of sustainability goals, requirements, and targets into ongoing NASA activities such that sustainable practices become the norm within NASA culture, we will use the following general rules:

- a) Ensure that every individual in the NASA community understands their role in the success of this SSPP.
- b) Utilize established teams, working groups, and communities of practice familiar with the functional area to get work done.
- c) Advise existing management, boards, panels, working groups, etc. to ensure that sustainability principles are incorporated into decisions for functional areas.
- d) Revise existing reports and planning documents generated for the different functional areas to reflect the larger sustainability objectives.
- e) Refine and frame NASA's sustainability approach in a way that blends with NASA culture.
- f) Refine the initial scope of NASA's sustainability focus through existing policy such as statutes and Executive Orders.
- g) Align sustainability goals, requirements, targets, and activities with the NASA Strategic Plan and other NASA policy.
- h) Adjust existing travel to manage and meet NASA's sustainability goals, requirements, targets, activities, etc.
- i) Leverage existing and future activities and projects to meet sustainability goals, requirements, and targets by supplementing each effort with additional sustainability funding, to meet the added requirements, etc.
- j) Recount stories of success and provide detail on current NASA activities, efforts, and initiatives that have already contributed to meeting the President's sustainability goals, objectives, and targets and the spirit of EO 13514.

1.4.1.3 NASA Headquarters Sustainability Working Group

In Fall 2009, NASA formed the HQ Sustainability Working Group (HQ SWG). The HQ SWG supports the development and coordination of consistent Agency policy, practice, and tools to further sustainability within NASA. This effort applies to NASA HQ programs, projects, and organizations that contribute to meeting specific sustainability goals, requirements, and targets established by the President, the NASA Administrator, and NASA's SSO. The goal of the HQ SWG is to ensure an integrated strategy towards sustainability across the Agency, leveraging existing programs and teams. This team is led by NASA's SSO and is composed of the HQ leads from each appropriate community of practice, many of whom are responsible for coordinating Center activities to achieve goals, objectives, and targets contained within the annual SSPP. The HQ SWG meets every two weeks and has representatives from

many NASA offices – Office of Strategic Infrastructure (OSI), Office of Procurement, and Office of the Chief Information Officer. Other offices attend based on the subjects being discussed, such as the Office of the Chief Financial Officer and the Office of General Counsel.

1.4.1.4 NASA Teams and Communities of Practice

NASA Centers and facilities, as illustrated in Figure 2, are geographically dispersed across the country. One method NASA successfully uses to strengthen shared practices within the institutional support community is the creation of teams and communities of practice. Many diverse disciplines and functional areas are needed to achieve all of the goals, requirements, and targets associated with sustainability. To execute, NASA has well established teams and communities of practice – energy, water, transportation, recycling and sustainable acquisition, design and construction, maintenance and operations, master planning, electronic stewardship, and others. Sustainability and the pursuit of more sustainable practices require the integration and coordination of these teams and communities of practice. In 2010, NASA formed new teams and communities of practice to help coordinate, plan, and execute the requirements of recently promulgated statutes and EOs such as EO 13514.

Figure 2. NASA Centers & Facilities



The lead for each community of practice is located at NASA HQ and the team is composed of one or more members from each Center or facility, with most Center personnel splitting their time between multiple responsibilities within the Center's overall mission support activities. A common example is for a Center energy manager to have additional duties in water management.

Early in 2011, NASA Center Directors appointed Center Sustainability Officers (CSOs) for their Centers. Together, the ten CSOs form the newest community of practice that will work directly with NASA's SSO to address Agency-level coordination and planning. Each CSO has an updated performance plan with an element that reflects commitment to EO 13514 and other external environmental requirements (see Section 1.4.2.4).

Each community of practice engages through face-to-face meetings, telecons, video teleconference, and WebEx. Since the NASA Centers and facilities are dispersed around the Nation, electronic means (e.g., telecons and video teleconferences) are used weekly or monthly. Face-to-face meetings occur once or twice annually and are often held concurrent with other meetings or conferences. Several OSI divisions sponsor biennial conferences for NASA civil servants and contractors and many of these communities use this opportunity to meet for a half day to discuss ongoing issues and share lessons learned.

Table 2 shows the interface between NASA teams and communities of practice with the eight goals listed in Section 2 of this SSPP (derived from requirements in EO 13514). While each team and community of practice will engage as necessary to help achieve all the sustainability goals, this table lists each team's primary areas of concentration.

Table 2. NASA Teams & Communities of Practice and Interface with SSPP Goals

HQ Agency Team or Community of Practice	NASA Organization Responsible for Team or Community of Practice	SSPP Goal							
		1	2	3	4	5	6	7	8
HQ Strategic Sustainability Working Group	OSI	1	2	3	4	5	6	7	8
Center Sustainability Officers (2)	OSI	1	2	3	4	5	6	7	8
Environmental Management System	EMD	1	2	3	4	5	6	7	8
Design and Construction	FED	1	2	3	4	5			8
Maintenance and Operations	FED	1	2	3	4	5			8
Energy Management	EMD and FED	1	2	3					8
Procurement	Office of Procurement	1	2			5	6	7	8
Greenhouse Gas Management (1)	EMD	1	2						8
Fleet Management	Logistics Management	1	2						8
Supply Chain Management (1)	Logistics Management		2				6		8
Master Planning	TC&RPMD and EMD		2	3					8
Climate Change Impacts and Adaptation (1)	TC&RPMD and EMD			3					8
Climate Adaptation Science Investigator (CASI) Workgroup (1)	SMD / ESD			3					8
Water Management	EMD			3	4				8
Natural Resources	EMD			3					8
Recycling and Sustainable Acquisition (RSA)	EMD					5	6	7	8
Data Center Consolidation	Chief Information Officer							7	8
Environmental Assurance and Green System Design	EMD								8

(1) community new in 2010; (2) community new in 2011

1.4.2 Coordination and Dissemination of the Plan to the Field

NASA's overarching strategy and framework for achieving the long-term sustainability goals outlined in NASA's SSPP is to present and discuss the SSPP through various media in multiple groups. Discussions continue to take place between NASA HQ leads and their specific team or community of practice through face-to-face meetings, telecons, video teleconferences, and WebEx. This makes goals, requirements, and targets (provided in the SSPP and other plans) known to the Center personnel who manage them for their Center. The following sub-sections illustrate some of the venues through which communication and SSPP and goal dissemination occurs: Management Panels and Committees; Principal Centers; and intranet portals. The last sub-section, 1.4.2.4, describes how NASA plans to enhance the communication between HQ and the Centers.

1.4.2.1 NASA Management Panels and Committees

NASA has several panels and committees that meet regularly to discuss Agency strategy, policy, processes, resources, and activities associated with NASA's overall environmental, energy efficiency, cultural resources, real property, and design and construction programs. These panels and committees have representation from all ten Centers and most facilities. Progress on goals, objectives, and targets outlined in NASA's SSPP will continue to be briefed at future meetings.

NASA's Environmental Management Panel (EMP) is chaired by the Director, EMD, includes the Center environmental managers, and coordinates Agency environmental activities. The panel advises the Director on environmental policy, planning, pollution prevention, compliance, sustainable practices, and restoration activities.

NASA Energy Efficiency Panel (EEP) is chaired by the Director, EMD, includes the Center energy managers, and coordinates Agency energy and water activities. The EEP advises the Director on energy efficiency activities, including energy and water conservation, GHG reduction, and use of renewable energy sources.

NASA Cultural Resources Management (CRM) Panel was established in 2006. It is chaired by the Director of EMD and membership includes the Historic Preservation Officers from each Center and facility, NASA's Chief Historian, and representatives from the Office of General Counsel, the Facilities Engineering Division (FED), the Technical Capabilities & Real Property Management Division (TC&RPMD), and mission directorate representatives. The CRM

Panel is charged with overseeing the development of NASA's CRM program to enable NASA to address regulatory obligations, issues, and initiatives related to historic properties and cultural resource management and identifies and discusses program needs to support field implementation of the CRM program.

The HQ TC&RPMD meets with the Center Real Property Accountability Officers to identify, assess and resolve real property management issues, establish measurements, and foster and share new ideas and ways of doing business. This community meets twice monthly via video conference and in person at least biannually.

The HQ FED meets with the Design and Construction Managers via the Engineering Construction Innovations Committee (ECIC) and with the Operations and Maintenance staff via the Operations & Maintenance of Facilities Innovations Team (OMFIT). Both are chartered to aggressively improve the process of delivering high quality facilities projects to its customers; improve the entire life cycle of facility ownership; promote sustainability concepts; identify, assess, and advance new practices, processes, and technologies; establish measurements; and foster and share new ideas and ways of doing business.

1.4.2.2 NASA Principal Centers

In addition to Agency-wide teams and communities of practice, NASA has Principal Center Initiatives. These are ongoing Agency-wide projects that are initiated by EMD, then contracted through and implemented by Centers. Principal Center Initiatives require a formal Memorandum of Agreement between the implementing Center and the NASA HQ OSI. Center personnel managing Principal Center Initiatives develop annual task plans to ensure that project services, procedures, and practices support the Agency's mission, commitment to compliance with applicable regulations, and protection of human health and the environment.

Regulatory Risk Analysis and Communication (RRAC) Principal Center - EMD established the RRAC Principal Center to provide regulatory support to the Agency by: a) monitoring emerging regulatory changes and conducting preliminary regulatory risk analyses relative to the requirements of NASA's mission; b) communicating potential regulatory risks, both direct and indirect, to NASA stakeholders; and c) facilitating and coordinating detailed environmental regulatory impact analyses and risk mitigation activities. The analyses and activities include emerging requirements associated with sustainable practices.

Technology Evaluation for Environmental Risk Mitigation (TEERM) Principal Center - EMD established the TEERM Principal Center to identify and validate environmental technologies through joint activities that enhance mission readiness and reduce risk while minimizing duplication and associated costs. TEERM projects commonly involve two or more NASA stakeholders in the planning and execution of laboratory or field testing of commercially available replacements for hazardous materials currently used by NASA.

Recycling and Sustainable Acquisition (RSA) Principal Center - EMD established the RSA Principal Center to provide technical resources and program implementation support for waste prevention, recycling, and sustainable acquisition. Sustainable acquisition is a program that requires Federal agencies to buy recycled-content, biobased content and other environmentally preferable products. Environmentally preferable purchasing benefits the environment and demonstrates our commitment to environmental stewardship. Section 2.5.4 contains more about the RSA.

1.4.2.3 NASA Intranet Portals

NASA has online, intranet portals for some of the teams and communities of practice and continues to develop more. The online portals are "one-stop shops" for users to quickly obtain information in a topic they are responsible for or interested in and help them complete their work. These portals are accessible to NASA civil servants and contractors who are inside the NASA firewall and have general content (e.g., Energy Conservation 101, OMB Scorecards, reports) of interest to the entire NASA community.

The overarching goal is to increase energy and environmental topic awareness, share knowledge throughout NASA, and assist in the development of new content by energy and environmental communities. Obviously, these communities are also focused on sustainability. These portals are being developed within an environment which is a secure, online space for groups to work better together through the use of workgroups, wiki functionality, and other collaboration tools. One desired outcome is to integrate the transfer of knowledge with existing work processes while not adding additional burden to the workforce. For each team, the portal provides additional information, updates, and alerts which supplements information provided at weekly or monthly telecons and face-to-face meetings.

Although the content is specific to the operations of a team, the information is also available for the casual reader who wishes to better understand a specific topic related to sustainability. This approach makes it easier for new members to quickly obtain current and historical information on successes, challenges, and obstacles for on-going efforts and activities.

1.4.2.4 Enhancing Coordination between Headquarters and the NASA Centers

Communities of practice, panels, committees, Principal Centers, and intranet portals are useful mechanisms for communicating and coordinating. The appointment of CSOs at each Center in early 2011 will strengthen and enhance communication and coordination between HQ and the Centers. This appointment coincided with updated performance standards reflective of the CSO's responsibility and leadership at their Center to meet EO requirements. To date, two video teleconferences have been held with the SSO and the CSOs, during which discussions were held regarding roles and responsibilities, 2011 SSPP development, collaboration to further integrate sustainability at the Centers, and identifying membership of existing communities of practice. The SSO and CSOs will meet regularly (through electronic means and face-to-face) to discuss broad Agency goals, challenges, and direction for sustainability. CSOs will have an opportunity to discuss their Center's goals, requirements, and targets and the challenges, risks, and opportunities associated with achieving them.

A NASA Sustainability Workshop is planned for June 2011 which will engage the group face-to-face for the first time. The proposed focus of this workshop will be to: 1) discuss strategies and policy for achieving long-term sustainability goals; 2) discuss NASA's emerging framework for managing existing environmental and energy statutory and EO requirements; 3) discuss methods to align Agency activities, processes, and resources to achieve goals, requirements, and targets, and 4) identify opportunities for further integrating sustainability requirements into existing NASA planning documents. Lessons learned, comments, and insightful suggestions will be used for planning and integration into NASA's 2012 SSPP development. This workshop will provide an opportunity to discuss the formation of Center Sustainability Working Groups (SWGs) at each NASA Center and facility. The structure and membership composition will be determined by the CSO and Center leadership to best fit the culture and work practices of their particular Center. Centers could use the HQ SWG model and include team members who lead various Center functional areas and manage existing statutory and EO requirements for energy, environment, and facilities. Just as the function of the HQ SWG is to assist in aligning activities, processes, and resources needed to achieve goals, requirements, and targets for the Agency, the Center SWG would perform this function for its Center or facility.

1.4.3 Leadership & Accountability

NASA's Assistant Administrator (AA) for the OSI was chosen on November 5, 2009 to be NASA's SSO. The OSI provides executive and functional leadership, policy, technical expertise, and oversight for Agency infrastructure including facilities engineering and real property, environmental management, logistics management, aircraft management, strategic capabilities assets program, and integrated asset management. The Office's mission is to ensure that the right infrastructure assets and capabilities are available in the timeframe needed by reducing current and future infrastructure-related risks to the Agency. The AA's role, responsibility, and authority as senior leader of the OSI are well aligned with duties as NASA's SSO.

As mentioned previously, each community of practice or team contributes to achieving more than one goal and each goal requires the support of many communities of practice and teams. This point is highlighted in Table 2. For the purposes of planning and reporting in NASA's SSPP, an 'Agency Lead' and a 'Goal Manager' is identified for each of the eight goals. These persons and their parent organizations were chosen based on the goals, requirements, and targets managed by their organization. Coordination with other functional offices, communities of practice, and teams occurs as needed.

Divisions within the OSI—EMD, FED, and TC&RPMD—manage the efforts for six of the eight individual goals in Section 2 of this SSPP. Division Directors within the OSI are assigned as 'Agency Lead' in Section 2 for each of these six goals. A staff member within the mentioned divisions will manage day-to-day efforts and coordination; this person is the designated 'Goal Manager.' Due to the close organizational relationship of many of these goal managers within NASA HQ, effective and frequent communication is possible. Frequent communication is critical due to the cross-cutting nature and overlap of many of these goals.

The Agency Lead for Goal 6 is NASA's AA for the Office of Procurement. Due to the heavy emphasis on data center operations and consolidation, NASA's Chief Information Officer was identified as the Agency Lead for Goal 7. Both have chosen staff members to manage their respective goals.

Periodically, NASA's SSO will report status to the NASA Mission Support Council (MSC) and did so in November 2010. The MSC is an essential component of NASA's Agency governance and is used to develop recommendations for senior level decisions for institutional plans and implementation strategies, including human capital, Agency operations, infrastructure, environmental, and technical capability investments. The council determines and assesses mission support requirements to enable the successful accomplishment of the Agency's mission. Future briefings will include progress and performance with respect to achieving the goals, requirements, and targets specified in this plan.

In this same forum, Center Operations personnel report to NASA senior leadership on specific issues at the individual Centers. NASA's SSO will determine how this forum will be used for CSOs to report status on progress towards Center sustainability goals, requirements, and targets.

To best align personnel and organizational activities and resources needed to achieve sustainability goals and targets within the OSI, Division Directors and their staff members have included specific goals and targets from existing statutes and EOs (e.g., EO 13423) for several years in their annual performance plans.

1.4.4 Agency Policy and Planning Implementation

NASA sees its recently formed HQ SWG, the NASA Sustainability Workshop, future NASA Administrative Solutions Conferences, and the potential formation of Center SWGs as critical methods for greater policy and planning integration.

HQ SWG membership is composed of Agency leads for various functional areas and communities of practice. The HQ SWG supports the development and coordination of consistent Agency policy, practice, and tools to further sustainability within NASA. This effort applies to NASA HQ programs, projects, and organizations that contribute to meeting specific sustainability goals and targets established by the President, the NASA Administrator, and NASA's SSO. The objective of the HQ SWG is to ensure an integrated strategy towards sustainability within NASA, leveraging existing programs and teams. The HQ SWG's responsibilities do not include the management of activities and efforts for achieving goals, requirements, and targets. These activities are managed by the appropriate mission support organizations.

The HQ SWG has several functions:

- Scope NASA's initial sustainability effort through analysis of existing Federal policy and statutes, and determine which policies, handbooks, guidance documents, MOAs, and MOUs can be utilized to help establish NASA's external goals, requirements, and targets related to sustainability.
- Develop and coordinate policies, processes, standards, and tools, in order to facilitate an integrated strategy towards sustainability in NASA.
- Identify and manage opportunities which expand and extend efforts and activities beyond compliance to meeting external goals, requirements, and targets. Sustainability opportunities are based on goals and targets determined by the NASA Administrator, Deputy Administrator, and SSO.
- Facilitate the sharing of information (lessons learned, best practices, etc.) between HQ SWG members, NASA leadership, SSO, CSOs, Center working groups, and NASA personnel.
- Provide recommendations to the SSO for coordination between HQ and the Centers, and between the Centers. Coordinate activities, tasks, and initiatives between different organizations. Establish ownership of specific requirements, goals, and objectives.

Many of the organizations responsible for the plans and reports listed in Table 3, Critical Planning Coordination, are represented in the HQ SWG. NASA will continue to evaluate expanding the HQ SWG membership and, at minimum, the HQ SWG will periodically meet with representatives from the other stakeholder organizations at NASA HQ. This should contribute greatly to the updating, implementation, and maintenance of these plans, policies and internal systems.

In the coming year, existing workshops and conferences for different mission support functional areas will be leveraged to discuss cross-cutting issues, risks, and opportunities related to policy and planning implementation. These meetings provide an important forum for exchange of information between Agency leadership and mission support staff. In summer 2011, the NASA SSO and CSOs will be attending the NASA Sustainability Workshop.

As mentioned previously, NASA will investigate the formation of Center SWGs for each Center and facility. As Center SWGs are formed, NASA will consider and select appropriate forums for the SSO to meet with CSOs to discuss ways of aligning Headquarters and Center activities, processes, and resources to achieve desired goals, requirements, and targets.

1.4.5 Agency Budget and Policy Integration

NASA's Strategic Programming Guidance is typically released in the 2nd quarter of the government fiscal year, followed shortly by Programmatic Resource Guidance that provides Headquarters Directorates and NASA Centers greater detail on what areas, programs, and projects to emphasize in future budget plans. The goals, requirements, and targets associated with EO 13514 and other statutes are considered at this time. Many of the SSPP goals fall under the purview of the Mission Support Directorate, which oversees the Agency management and operations, institutional investments, and Center management and operations budgets. The Mission Support Directorate, therefore, plays an important role in budget alignment as its purpose is to integrate decision-making processes,

identify and resolve issues that cross programmatic and institutional lines, and provide independent leadership and decision making for selected cross-cutting initiatives. NASA's SSO reports to the Mission Support Directorate Associate Administrator.

Interaction and collaboration between NASA's SSO, HQ SWG Chair, Mission Support Directorate staff, and the Office of the Chief Financial Officer will continue throughout 2012 to discuss known and emerging resource requirements associated with achieving Agency sustainability goals, requirements, and targets, and associated implementation plans. Further coordination will occur throughout the year to identify the linkage between SSPP goals, planned activities, and NASA budget items. Table 3, required by the CEQ/OMB template, illustrates the relationship between particular Agency plans and reports and the EO 13514 sustainability goals.

Table 3. Critical Planning Coordination

("Yes" indicates SSPP goal is relevant and incorporated into report or plan; "No" indicates relevance but that it has not yet been incorporated; "N/A" means goal is not relevant to report or plan; and "FAN" means further analysis necessary to determine relevance.)

Originating Report / Plan	Scope 1 & 2 GHG Reduction	Scope 3 GHG Reduction	Develop and Maintain Agency Comprehensive GHG Inventory	High-Performance Sustainable Design / Green Buildings	Regional and Local Planning	Water Use Efficiency and Management	Pollution Prevention and Waste Elimination	Sustainable Acquisition	Electronic Stewardship and Data Centers	Agency Specific Innovation
	Goal 1	Goal 2	Goal 2	Goal 3	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8
GPRA Strategic Plan (2011 NASA Strategic Plan)	N/A	N/A	N/A	Yes	Yes (1)	Yes	FAN	FAN	FAN	FAN
Agency Capital Plan (Capital Investment Program Plan (CIPP))	Yes	Yes (1)	N/A	Yes	Yes	Yes	Yes (1)	Yes (1)	Yes (1)	FAN
A-11 300s – Capital Asset Plan & Business Case Summary	N/A	N/A	N/A	Yes	N/A	Yes	FAN	FAN	Yes (2)	FAN
Annual GHG Inventory and Energy/ Water Data Report	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	FAN	No
EISA Section 432 Facility Evaluations/Project Reporting/Benchmarking	Yes	Yes	Yes	Yes	N/A	Yes	FAN	FAN	FAN	No
Budget	No (3)	No (3)	Yes	No (3)	Yes	No (3)	Yes	No (3)	Yes	FAN
Asset Management Plan/3 Year Timeline	N/A	N/A	N/A	Yes	Yes	N/A	FAN	FAN	FAN	No
Circular A-11 Exhibit 53s – Agency IT Investment Portfolio	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes (2)	FAN
OMB Scorecards	Yes	Yes	Yes	Yes	Yes (1)	Yes	Yes	Yes	Yes	No
DOE's Annual Federal Fleet Report to Congress and the President (EPACT)	Yes	Yes	Yes	N/A	Yes	N/A	N/A	Yes	N/A	No
Data Center Consolidation Plan	Yes	Yes	Yes	No	Yes (1)	N/A	N/A	Yes	Yes	No
Environmental Management System	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Instructions for Implementing Climate Change Adaptation Planning	FAN	FAN	FAN	FAN	Yes	FAN	N/A	N/A	FAN	Yes
Sustainable Building Implementation Plan	Yes	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	No
Sustainable Acquisition, Practices: Green Purchasing Waste Management, and Chemicals Management Report	N/A	N/A	N/A	Yes	N/A	Yes	Yes	Yes	N/A	N/A
NASA's Toxic and Hazardous Chemicals Reduction Plan (EO 13423)	Yes	N/A	Yes	FAN	Yes (1)	N/A	Yes	Yes	N/A	No

(1) Indirect - report/plan guides and informs the specific SSPP Goal

(2) NASA IT Infrastructure 300

(3) Insufficient funding to meet goal and associated targets

1.4.6 Methods for Periodic Monitoring and Evaluation of Progress

Several existing systems and processes enable NASA to: collect data and information; monitor and evaluate progress on meeting the SSPP goals requirements and targets; extend or expand projects that have net benefits; and reassess or discontinue under-performing projects.

NASA's EMS, already described in Section 1.4.1.1, is the overarching management system which emphasizes the plan-do-check-act process. NASA's EEFs are already in place to monitor and evaluate progress at each Center on a 3-year cycle for compliance with requirements associated with recycling, energy, water, pollution prevention, affirmative procurement, cultural resources, natural resources, and management practices. NASA's NETS aids in data collection, trend analysis, and report preparation. The development and semiannual submission of the OMB Scorecard on Sustainability/Energy also enables NASA to track its progress against various metrics and goals.

To manage several Agency-level reporting requirements that require data from the NASA Centers specific to sustainable practices (e.g., energy and water report), NASA developed and operates NETS, an automated application and database for Center users who provide summary level data required by existing requirements for Agency-level reporting. NETS enables HQ users to review Center data and prepare consolidated Agency reports, ultimately improving the quality of environmental information through single source data entry, standardized data, and adherence to specific validation criteria. NETS also reduces staff time required to generate mandatory Agency-level reports by over 50 percent and enhances Agency-wide environmental management through improved access to performance data that identifies trends, problem areas, and improvement opportunities.

The FED uses several tools for projecting and tracking sustainable facility progress. The Real Property Management System (RPMS) is a method to track two goals: a) consolidation of facilities, for which NASA established a 10% reduction goal by 2020 and b) achievement towards the goal of "15% by 2015", a mandate under EO 13423 that 15% of the existing Federal capital asset building inventory of the Agency as of the end of FY 2015 incorporate the sustainable practices in the *Guiding Principles*⁴. Both efforts aid in the reduction of energy and water consumption and are aligned with NASA's Agency Facilities Strategy. Facilities renewal funding plans were reduced significantly in the most recent Administration budget proposal. NASA is now reevaluating its strategy in the context of new resource expectations, and may revise its milestones accordingly.

The FED and the TC&RPMD utilize the RPMS to list the Data for Deferred Maintenance and Sustainability reporting for each facility via the Real Property Council Reporting Guidelines each year. The FED Sustainable Building Implementation Plan (SBIP), which was completed in 2007, was developed to prioritize and develop corrective actions necessary to meet the sustainable facility goals outlined by EO, including the identification and tracking of sustainable facility projects. In development is sustainable buildings implementation plan guidance for existing buildings. This guidance will aid in tracking and measuring progress of existing buildings identified as targets to meet the "15% by 2015" sustainable facility goal.

In addition to the efforts described above, NASA is currently collaborating with EPA's Lean & Environment Initiative to further integrate sustainability considerations into NASA's Lean Six Sigma efforts.

1.5 EVALUATING RETURN ON INVESTMENT

1.5.1 Overview

Embedding sustainability into any organization requires an understanding and respect of its culture. NASA must proceed in a manner that preserves, enhances, and strengthens our ability to perform our mission indefinitely. To do this successfully, NASA must address internal and external risks that challenge our ability to reach our mission goals. As a federal Agency, NASA has long used risk management approaches to ensure mission success while simultaneously safeguarding critical infrastructure and other resources entrusted to NASA by the public. NASA HQ and NASA Centers, while including life cycle return on investment (ROI) factors, evaluate their planned and on-going operations using a risk methodology that incorporates elements of Likelihood and Impacts to Safety, Performance, Cost, and Schedule. Thus, these elements, which determine risk severity, are used to identify priorities for planning and funding so that the greatest, most severe risks to mission, human health, and the environment are managed and mitigated first. NASA seeks to optimize the efficient use of public funds, promote the health of the planet, and operate in a way that benefits our local, national and international communities.

The sections that follow illustrate the prioritization factors considered during project and program investment analysis for deferred maintenance, capital energy investments and NASA's environmental compliance and restoration

⁴ Guiding Principles can be found at <http://www.epa.gov/oaaintnt/projects/requirements.htm#gps>.

program. All consider life cycle cost analysis, risk factors, and other costs and benefits, as appropriate. The last section discusses the ongoing efforts to incorporate climate change risks and vulnerabilities as an additional set of factors to consider during investment decisions and an opportunity to optimize mission success by considering long-term, strategic interests.

1.5.2 Operations & Maintenance and Deferred Investments

NASA plans and prioritizes its operations and maintenance funding decisions, including recognizing its deferred maintenance backlog, in accordance with NPR 8831.2E, Facilities Maintenance and Operations Management. The Centers manage their Operations and Maintenance (O&M) Program using a risk prioritization process and assess and prioritize their maintenance tasks and repair projects in accordance with their highest risk, such as: mission requirements, health, safety, environmental requirements and building and construction code requirements. The Centers use their Reliability-Centered Maintenance Management Program, the annual increment of their Facility Condition Assessments, the annual Deferred Maintenance Assessment (DMA) and their risk assessment process to establish their annual work plan and five year plan. The annual condition assessment is a process that provides a facility condition index rating, a system condition index rating, and a Deferred Maintenance (DM) estimate based on a parametric estimating method. The condition assessment process is a useful tool for tracking and trending the condition of NASA facilities.

The Centers are managing their O&M decisions based upon life cycle cost, specifically ROI. Typically, within the O&M arena, NASA repairs or replaces old components with new components that are more efficient to operate, control, and maintain, based on a life cycle cost estimate. NPR 8831.2E requires maintenance personnel to make decisions that minimize life cycle maintenance and repair costs in all maintenance and operations activities. NASA is not, at this time, sufficiently funded to reduce its deferred maintenance backlog and has developed the following approach to reduce DM:

- Repair by Replacement when rehabilitation of facilities is not cost effective based on a life cycle cost estimate.
- Rehabilitate facilities when cost effective based on a life cycle cost estimate.
- Demolish and/or deconstruct facilities that are no longer required.
- Continue to smartly shut down and mothball facilities if they are not needed in the future.
- Continue to implement O&M best practices and expand the use of Predictive Testing and Inspection techniques to drive down O&M costs.

NASA has calculated that the impact of our currently unused or soon to be deconstructed or demolished buildings has little impact on GHG emissions. However the consequences of a large amount of deferred maintenance, besides poor facility condition, are higher than normal operations and maintenance costs, high equipment failure rates and higher energy and water consumption. NASA continues to strive to meet our High Performance and Sustainable Building Requirements when replacing facilities, which will help reduce our GHG emissions. We will also continue to reduce energy consumption in our existing buildings to further lower emissions.

1.5.3 Capital Energy Investments in Existing Buildings

NASA's "Report to the White House Office of Management and Budget on NASA's Process for Reviewing Decisions on Large Capital Energy Investments in Existing Buildings" was submitted to OMB on January 9, 2009, fulfilling the National Energy Conservation Policy Act (NECPA) Section 543(f) requirement established by Energy Independence & Security Act 2007 (EISA) Section 434(a) to report to OMB on NASA's process for reviewing decisions on large capital energy investments in existing buildings.

As described in the submission, NASA implements large capital energy investments in existing buildings through facility projects as part of NASA's Construction of Facilities (CoF) program. NPR 8820.2F, Facility Project Requirements, documents NASA's process for the planning and acquisition of facility projects. The process requires use of life-cycle cost analysis and project review with written approval prior to obligating funding. Most importantly, as described in Chapter 1, Section 1.2.c of NPR 8820.2F, is the use of life-cycle cost versus first cost to select project systems, equipment, materials, and methods.

1.5.4 Environmental Compliance and Restoration (ECR) Program

NASA is currently drafting its NPR for its ECR program (will be NPR 8590.1A). A priority is the development of an ECR Program Project Prioritization Decision-Support process designed to help NASA implement a systematic, risk-based method for prioritizing ECR Projects in a resource constrained environment. The process is not designed to supplant decision makers but to provide them with the data, information and decision-support tools with which they

can make sound, risk-informed and data-centered ECR resource allocation decisions. The Principles of Prioritization embody the values of the EMD and incorporate elements of NASA's Strategic Goals:

- Protection of human health and the environment
- Natural resource restoration
- Opportunity for proactive or preventive management action
- Sustainability for climate, energy or water
- Mission sustainment
- Reduction of environmental liability
- Stewardship of public trust and stakeholder concerns
- Compliance with legal requirements
- Technology transfer and Science, Technology, Engineering and Mathematics (STEM) Learning
- Partnerships for leverage

While cost is not the primary driver for the Agency's restoration projects, the cost of selected remedial actions is one of the nine evaluation criteria used when selecting the appropriate remedy. These remedial action cost estimates are based on lifecycle return on investment. The nine criteria that are balanced are:

- overall protection of human health and the environment
- compliance with applicable state and local regulatory requirements
- long-term effectiveness and permanence
- reduction of toxicity, mobility, or volume
- short-term effectiveness
- implementation ability
- cost
- State acceptance
- community acceptance

The alternatives are analyzed individually against each criterion and then compared against one another to determine their respective strengths and weaknesses and to identify the key trade-offs that must be balanced for the site. The results of the detailed analysis are summarized so that an appropriate remedy can be selected.

1.5.5 Climate Change Risk and Vulnerability

As a research organization tasked with expanding knowledge of the Earth and its systems, NASA is applying its preeminent expertise in climate science to help manage the risks to NASA mission success posed by climate change impacts. A key element in managing these risks is making appropriate adaptations to institutional systems. A long view of adaptation, implemented through modest changes to renewal investments rather than through adaptation-exclusive investments, will help minimize costs and negative impacts. Climate change impacts are of concern because many Agency assets are located along America's coasts, where sea level rise and increased frequency of intense storms are a concern, and in areas where changes in precipitation is expected to impact potable water supplies. While climate change is a global phenomenon, impacts are being and will be felt at all scales. NASA recognizes that integrating climate change adaptation into installation planning is a local activity.

To identify, characterize and manage climate change risks, NASA's strategy is to: 1) make data and NASA's climate science experts available to NASA's institutional stewards through a series of interactive workshops, and 2) maximize the opportunity for progress by using successfully tested methodologies for adaptation planning.

In addition to being a major provider of research on climate and global change, NASA participates actively in the Interagency Climate Change Adaptation Task Force, with NASA Science Mission Directorate, Earth Science Division (ESD) scientists on the Task Force, as well as on three of the Workgroups. NASA's ESD scientists are also actively involved and leading the efforts to produce the 2013 National Climate Assessment report through the Interagency National Climate Assessment Task Force. To leverage this expertise and knowledge of interagency climate efforts, OSI is partnering with NASA ESD to develop and implement a systematic approach to identifying, characterizing, and managing local and regional risks associated with climate change. Guided by OSI, NASA climate scientists are coordinating with institutional stewards through a series of workshops to help NASA Centers and their communities:

- Identify and understand climate change risks and opportunities;
- Characterize the risks and explore an appropriate range of responses; and,
- Begin developing responsible management strategies.

These NASA Center-specific workshops, titled *Resilience and Adaptation to Climate Change Risks Workshop*, were held at Kennedy Space Center and the Space Coast in May 2010 and at Ames Research Center and Silicon Valley in

February 2011. A small science workshop is planned at Dryden Flight Research Center in August 2011 and an additional larger, Center-level workshop is planned for Langley Research Center in September 2011.

To maximize progress, these workshops are being based on methodologies successfully implemented by New York City planners. The New York City Panel on Climate Change (NPCC), co-chaired by Cynthia Rosenzweig, Ph.D., leader of the Climate Impacts Research Group at NASA's Goddard Institute for Space Studies (GISS), developed and tested adaptation planning tools and methodologies to help varied stakeholders identify climate vulnerabilities and generate strategies for building resilience. The NPCC was convened by Mayor Bloomberg to help "develop a framework and tools to assist the City create a risk-based response to climate change that is grounded in state-of-the-art science information."⁵ Through *PlaNYC*, New York City's comprehensive sustainability plan, the NPCC and the publication they produced, *Climate Change Adaptation in New York City: Building a Risk Management Response*⁶, assisted New York City in crafting strategies to improve the city's climate resilience.

In May 2010, NASA ESD awarded eight internal grants to be used over 18 months to: a) identify Center representatives for a Climate Adaptation Science Investigator (CASI) Workgroup to assist in the development of adaptation strategies for NASA Centers and NASA as a whole; b) contribute to the advancement of relevant climate science and impacts assessment at the Center-scale; c) contribute to the body of knowledge on applying Earth science in decision-making; and, d) encourage student research support. In May 2011, NASA ESD received proposals in response to an internal call to NASA Centers for science and applications research to develop tools and assessment capabilities for the 2013 National Climate Assessment (NCA) and to build ongoing capabilities for future NCAs. Some results of this research will enable modeling and assessment capabilities at scales also relevant to NASA Center planning needs. Approximately 10 awards will be granted for the 2011 to 2013 period (27 months). Additionally, NASA ESD is planning a similar external call for proposals for projects that will be funded to start in 2012.

The following paragraphs summarize NASA's progress in relation to the "Federal Policy Goals to Advance National Adaptation" outlined in the *Progress Report of the Interagency Climate Change Adaptation Task Force*, published in October 2010.

Goal 1. Encourage and Mainstream Adaptation Planning Across the Federal Government

NASA began doing NASA-wide climate change adaptation planning in 2009. At its first two workshops, NASA initiated a flexible framework that uses a phased time-slice approach, projecting impacts for the 2020s, 2050s, and 2080s.

Goal 2. Improve Integration of Science into Decision Making

NASA scientists and NASA institutional managers have created a handout for communicating site-specific (15-km by 15-km) climate change sciences information to NASA Centers. NASA is in the process of developing an internal online climate change portal for data and information on adaptation. NASA is actively encouraging communication between its climate scientists and institutional stewards. NASA is collaborating with interagency efforts to improve the integration of science into decision making through the U.S. Global Change Research Program Adaptation Science Workgroup."

Goal 3. Address Key Cross-Cutting Issues

- *Protect human health by addressing climate change in public health activities* - NASA has initiated a "people and community" perspective in its Agency sponsored workshops in investigating climate change impacts and adaptation at its Centers.
- *Build resilience to climate change in communities* - NASA has shared climate change information with communities and encouraged communities to participate in NASA climate change workshops.
- *Facilitate the incorporation of climate change risks into insurance mechanisms* – NASA, like many Federal agencies, self-insures its assets. NASA applies risk management to its assets at risk from the impacts of climate change.
- *Address additional cross-cutting issues* - NASA is investigating the impact of climate change on threatened and endangered species at its Centers.
- In collaboration with the CDC and Indiana University, NASA has ongoing pilot projects working with the communities of Philadelphia, Pennsylvania, Dayton, Ohio, and Phoenix, Arizona to improve

⁵ Remarks by Mayor Bloomberg in Forward to *Climate Change Adaptation in New York City; Building a Risk Management Response*, page 1.

⁶ For the Annals of the New York Academy of Sciences in 2010, <http://onlinelibrary.wiley.com/doi/10.1111/nyas.2010.1196.issue-1/issuetoc>

their heat watch/warning systems through the development of tools that integrate NASA satellite data products with social and health data."

Goal 4. *Enhance Efforts to Lead and Support International Adaptation*

NASA has initiated dialogues with various international entities and participated in international forums on the issue of climate change. NASA activities include a continuing dialogue with representatives of European Space Agency (ESA) and Centre National d'Études Spatiales (CNES). Further, NASA has sponsored and hosted international events that highlight its activities in the area of adapting to climate change and foster the exchange of information; for example, NASA and the Portuguese Center for Pollution Prevention (C3P) co-sponsor and co-host the *International Workshop on Environment and Alternative Energy* that includes presentations on climate change impacts and adaptation. NASA's SERVIR⁷ program is jointly funded by the U.S. Agency for International Development (USAID) through their Global Climate Change Team. Climate change adaptation is a major focus of the NASA/USAID agreement regarding SERVIR. In response, NASA is soliciting under the Research Opportunities in Space and Earth Sciences (ROSES) 2011⁸ call for proposals for a SERVIR Science Team, with strong encouragement for proposals that focus on building the capacity of the SERVIR regions (East Africa, Central America, the Caribbean, and the Himalayas) to prepare for and adapt to climate change impacts.

Goal 5. *Coordinate Capabilities of the Federal Government to Support Adaptation*

NASA co-founded, co-sponsors, co-chairs, and co-hosts (with the US Army Corps of Engineers) the "Interagency Forum on Climate Change Impacts and Adaptation" meetings. NASA scientists and NASA institutional managers are working together to improve communications concerning climate change and to more effectively support NASA stakeholders. Further, NASA is working with other Federal agencies and private sector entities to co-chair sessions at the 2011 Environment, Energy Security, and Sustainability (E2S2) Symposium.

Appendix 1 of this SSPP includes the required Agency's Climate Change Adaptation Policy Statement.

1.6 TRANSPARENCY

NASA's founding legislation, the National Aeronautics and Space Act of 1958, instructed NASA to "...provide for the widest practicable and appropriate dissemination of information..." Transparency has been embedded in NASA culture for over 50 years. In January 2009 the President instructed the Director of the OMB to issue an Open Government Directive. That Directive, issued in December 2009, directed executive departments and agencies to take specific actions to implement the principles of transparency, participation, and collaboration set forth in the President's Memorandum. NASA has embraced this Open Government challenge.

NASA's enhanced efforts to incorporate these principles recognize NASA's long-held awareness that we cannot achieve our mission alone. NASA has a long history of participation with scientific and engineering communities within the nation's industrial organizations and institutions of higher education. Through grants, contracts, scholarships, and other arrangements, NASA has extensive participation and partnerships with these communities. Additionally, NASA has a renewed commitment to education with an emphasis on STEM learning.

Commitment to transparency, participation and collaboration -- both within NASA and between NASA and the broader public -- affirms the use of methods by which we achieve our mission and strengthen our scientific and engineering communities. Actively incorporating these principles makes it possible for NASA to increase accountability, make information accessible, improve the quality of its decisions, and increase employee and public participation and engagement in NASA's mission. These enhanced approaches will be used to communicate and interact with the public about NASA's strategic sustainability efforts.

1.6.1 Internal Agency Communication

As discussed previously in Section 1.4.2, several methods of information dissemination and coordination will be used to communicate NASA's SSPP and how Centers and facility employees can contribute to successful plan implementation. We will use the HQ SWG, existing and new communities of practice, internal portals, panels, telecons, and video conferencing to communicate progress and results towards achieving NASA's sustainability goals, requirements, and targets. Comments received through any of these mechanisms will be considered carefully.

⁷ NASA's SERVIR program is described at: http://www.nasa.gov/mission_pages/servir/index.html

⁸ More about ROSES can be found at: <http://science.nasa.gov/researchers/sara/grant-solicitations/>

NASA's SSPP was discussed and will continue to be discussed at community of practice meetings. NASA's SSPP will continue to be available in electronic and hardcopy versions and distributed at upcoming meetings and forums. It will also be made available to NASA personnel and support contractors through NASA's environmental management intranet portal. In future releases of NASA's SSPP, goal status and implementation plans will be made available to appropriate communities of practice for review and editing through their intranet portals or other preferred means.

NASA's HQ SWG developed a community of practice directory with HQ and Center points of contacts and this has been shared with the community of practice leads and the CSOs. NASA's SSO will be meeting with the CSOs this year to identify ways to improve internal communication, raise employee awareness, and create training as necessary.

In November 2010, NASA's SSO provided a briefing at the Mission Support Council. As mentioned previously in this SSPP in Section 1.4.3, this council is an essential component of NASA's Agency governance and is a venue in which to discuss issues and make decisions which require Agency-wide integration, visibility, and approval. Future briefings will include progress and performance to achieving the goals and metrics specified in this plan.

NASA's HQ SWG will investigate providing an annual briefing from the NASA Administrator, Deputy Administrator, and SSO that will be broadcast live on NASA TV and on the Web.

1.6.2 External Agency Communication

External communication to the public will occur through the media, the internet, and conferences NASA supports. NASA's extensive website which is available to the public—www.nasa.gov—will provide information on efforts NASA is undertaking to enhance energy security, a healthy environment, and environmentally-sound operations at all NASA Centers. To showcase critical milestones in achieving NASA's long-term sustainability goals, the OSI will develop press releases for distribution through regular public affairs channels.

In the last year, NASA's SSO has provided a number of interviews and presentations to provide insight into NASA's sustainability efforts and activities. They include a FedNews Radio Interview on Green Gov, presentation at GovGreen, and podcasts with other environmental organizations.

NASA's Ames Research Center has developed a Greenspace Initiative⁹ which showcases that Center's diverse portfolio of alternative energy and environmental projects. In 2011, NASA's HQ SWG, with assistance from Center personnel, will start to develop a similar website to include projects and initiatives from across the Agency.

In the coming months, NASA will use conferences, seminars, symposia, and other external forums to raise awareness on NASA's sustainability efforts. NASA will investigate ways to apply lessons learned from NASA's Open Government Plan (<http://www.nasa.gov/open/plan/>) to achieve greater transparency, participation, and collaboration when it comes to NASA's role in protecting the environment and creating a sustainable world.

⁹ <http://www.nasa.gov/centers/ames/greenspace/>

Section 2: Goal Summaries

SUMMARY OF ACCOMPLISHMENTS

NASA draws the reader's attention to just several initiatives below. Many more accomplishments are described in specific Goal sections.

- NASA evaluated its renewable energy use across all Centers, perceived a gap between the required renewable energy goal and actual usage, and procured 20,000 megawatt hours (MWh) at the Agency level to meet the required renewable energy goal.
- One NASA Center uses landfill gas in its boilers in lieu of natural gas to heat water for its steam system. Since natural gas is almost four times more expensive than landfill gas, the Center has avoided \$15M in utility costs since 2003.
- NASA achieved a 30% response rate to a short, targeted voluntary commuting survey which was provided electronically to all NASA civil servants. The survey generated significant interest with over 20% of the responders volunteering for future efforts on commuting and GHG reduction issues at their NASA Center.
- NASA received its first US Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED®) Platinum rating in 2010 for a 92,000 square foot (sf) building estimated to use 57.8% less energy when compared to a typical office building. NASA expects to receive a second LEED® Platinum rating shortly for a 11,340 sf facility which is also striving to be NASA's first "net-zero" facility.
- A NASA Center was recognized for implementing a water reuse project, winning the Federal Energy and Water Management – Water Conservation Small Group Award. The overall effort decreased the Center's potable water consumption by more than 80 million gallons and saved \$404,000 in FY 2009.
- NASA exceeded the 2015 goal of 50% for construction and debris (C&D) solid waste diversion, by diverting 75% in FY 2010. NASA also met its previously established 2010 goal of 35% diversion in non-hazardous solid waste by diverting at least 36%, putting it on a path to meet the new FY 2015 diversion goal of 50%. NASA also established an Agency-wide Green the Cafeteria workgroup.
- NASA completed a walkthrough of all 79 data centers and performed a power monitoring assessment. In FY11, NASA reduced the number of data centers to 54 from 79.

The goal summaries that follow contain the eight subsections outlined in the OMB/CEQ SSPP template but are not in the same order. "Highlights" is the third item addressed and "Agency Status" and "Implementation Methods" have been switched.

2.1 GOAL 1 - SCOPE 1 & 2 GREENHOUSE GAS REDUCTION

NASA established its Scope 1 and 2 GHG emissions reduction target of 18.3%, based on an initial FY 2008 baseline estimate of 1,038,447 metric tons of carbon dioxide equivalent (MtCO₂e) across its institutional portfolio.

Development of NASA's initial baseline and projected GHG reduction target followed the guidance in the early stages of implementing EO 13514, based only on existing reported energy data. Current guidance clarified and expanded the reporting requirements, resulting in the updated FY 2008 baseline and FY 2010 inventory. Currently, including allowances for renewable energy use, the updated FY 2008 baseline for Scope 1 and 2 estimated emissions total is 1,356,330.9 MtCO₂e. NASA continues to anticipate that key energy intensity reduction efforts will contribute to both GHG emissions reductions and achievement of projected reduction targets.

2.1.1 Goal Description

a. Scope 1 & 2 Greenhouse Gas Emissions

- 1) Reduce Scope 1 & 2 GHG emissions by 18.3% by FY 2020, from an FY 2008 baseline.
- 2) Greenhouse Gas Emissions Intensity - Reduce Agency's Scope 1 and 2 GHG Emissions by 1% annually or a total of 9% by FY 2015 from FY 2003 energy intensity baseline (Originally EO 13423 Toxic & Hazardous Chemical Plan Goal set internally by NASA. Now subsumed under the targets and reporting required under EO 13514).

b. Energy and Buildings

- 1) Reduce facility energy intensity – Reduce energy consumption per gross square foot of building area by 3% annually from FY 2003 baseline for FY 2006 – FY 2015 (30% Total) (EO 13423) following the per FY reductions mandated in EISA 2007.
- 2) Increase Renewable Electricity Installation & Use.
 - i. Increase percentage of total electricity from renewable sources (3% FY 2007 – FY 2009; 5% FY 2010 – FY 2012; 7.5% FY 2013+).
 - ii. Strive for at least half of the renewable energy from new renewable sources (placed into service after January 1, 1999).

- 3) Reduce per capita energy consumption through space management.
- c. Fleet**
- 1) Reduce Petroleum Use in Fleet Vehicles – Reduce petroleum use 2% annually from FY 2005 baseline for FY 2005 – FY 2020 (30% Total).
 - 2) Increase Use of Alternative Fuels in Alternative Fuel Vehicles (AFVs) and Flex-Fuel Vehicles (FFVs) – Increase alternative fuel use by 10% annually from 2005 baseline for FY 2005 – FY 2015.
 - 3) Optimize Use of Vehicles and Right-Size Fleet.
 - 4) Increase Use of Low Emission and High Fuel Economy Vehicles .
 - 5) Replace conventional senior executive fleet with low-GHG emitting, highly-efficient vehicles.
 - 6) Agencies operating shuttle buses should discuss challenges related to consolidation of and/or sharing of transportation services with other agencies.
 - 7) Discuss Agency's efforts to implement sustainable transportation options by: acquiring low GHG emitting vehicles such as hybrids and AFVs; optimizing the number of vehicles in the Agency's fleet, using alternative fuel in AFVs and FFVs; developing alternative fuel infrastructure; direct spending on training; and procurement of environmentally preferable motor vehicle products. Identify specific challenges in implementing these or other items related to implementation of sustainable transportation within your Agency.
- d. NASA commitment to evaluate, update, and strengthen internal data bases, such as NETS, undertake targeted energy reduction projects, and take other actions, where appropriate, such as trend analysis over time.**

2.1.2 Agency Lead for Goal

Agency Lead: James Leatherwood, Director, Environmental Management Division
Goal Manager: Linda Wennerberg, Ph.D., Senior Environmental Scientist, Environmental Management Division
Goal Team: Holger Fischer, NASA Agency Energy Manager, Environmental Management Division
 Timothy Currie, NASA Agency Transportation Manager, Logistics Management Division
 Wayne Thalasinis, NASA Facilities Energy Manager, Facilities Engineering Division

2.1.3 Highlights

In 2010, NASA achieved a fleet petroleum use reduction of 19.5% compared to the 2005 baseline, falling just short of the EO 13514 project goal for 2020; thus, NASA will meet this goal early. NASA's alternative fueling infrastructure enabled NASA to increase alternative fuel use from 149,000 gallons (GGE), up to 276,000 gallons (GGE) in 2010, thus, meeting the 2010 EO 13514 projected goal.

In the past NASA relied on the Centers to manage and meet energy requirements at the local level with little overall planning at the Agency level. An Agency level planning effort initiated over the past year yielded better coordination and results. NASA evaluated its renewable energy use across all Centers, perceived a gap between the required renewable energy goal and actual usage, and procured 20,000 MWh at the Agency level to meet the required renewable energy goal. NASA is striving to build on this effort to develop an Agency-wide strategy. In keeping with that strategy, NASA is also altering its renewable energy investment strategy and emphasizing identification of large projects that can make a significant difference for the Agency, rather than initiating smaller projects at each Center.

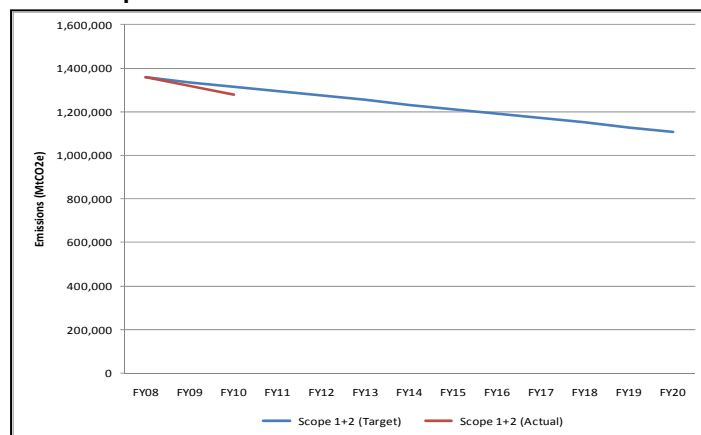
In FY 2010, eight NASA facilities earned LEED® certifications including Silver (2 buildings), Gold (5 buildings), and Platinum (1 building). Building 20, the Lead Office for Transition at JSC became the first LEED® Platinum certified facility for NASA. Currently NASA has four facilities awaiting LEED® certifications (1 Silver, 2 Gold, and 1 Platinum), ten buildings in construction and seeking LEED® recognition (7 Silver and 3 Gold), and ten buildings in design. NASA exceeded, in FY 2010, one million square feet of sustainable facilities through new construction and major rehabilitation.

NASA's Goddard Space Flight Center (GSFC) uses landfill gas in its boilers in lieu of natural gas to heat water for its steam system. Natural gas is almost four times more expensive than landfill gas and the Center has avoided \$15M in utility costs since 2003 by using landfill gas rather than natural gas.

2.1.4 Agency Status

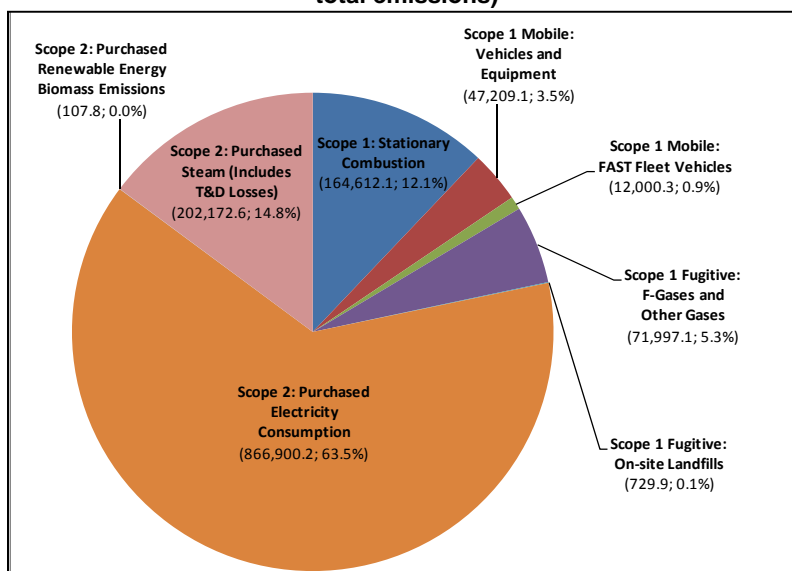
Goal 1. Element a.1 - Reduce Scope 1 & 2 Greenhouse Gas Emissions by 18.3% by FY 2020, from an FY 2008 baseline

NASA evaluated the updated FY 2008 baseline and the FY 2010 inventory to initiate trends analysis for Scope 1 and 2 GHG emission reductions. Based on this initial set of data, the trend indicates NASA is making progress to reduce its Scope 1 and 2 GHG emissions, tracking with required energy reductions (Figure 3).

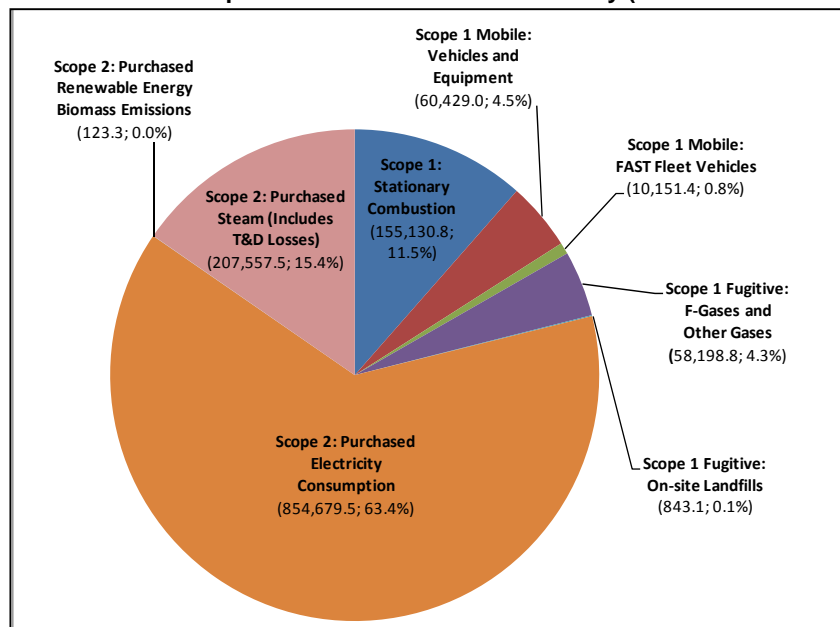
Figure 3. NASA Scope 1 & 2 GHG Emissions Trend vs. Annual Reduction Targets

The following text and figures below describe the methods used to calculate the updated FY 2008 baseline and FY 2010 inventory.

NASA utilized the Department of Energy (DOE) Federal Energy Management Program (FEMP) Portal Tool, as required under EO 13514, and conformed to the current guidance and Technical Support Document to develop an updated FY 2008 baseline and FY 2010 inventory. The updated baseline and inventory supported the development of this year's Energy and Environmental Scorecard submitted to DOE and OMB in June 2010. Previously, in accordance with EO 13514, NASA developed an initial FY 2008 baseline for Scope 1 and 2 estimated GHG emissions and established a Scope 1 and 2 emission reduction target of 18.3% by FY 2020. Including allowances for renewable energy use, the updated FY 2008 baseline total for Scope 1 and 2 estimated emissions is 1,356,330.9 MtCO₂e. Figure 4 reflects NASA's updated anthropogenic Scope 1 & 2 FY 2008 emissions of 1,365,729.1 MtCO₂e, which after accounting for the renewable energy allowances of 9,398.2 MtCO₂e (not represented on Figure 4), equals the new FY 2008 baseline of 1,356,330.9 MtCO₂e.

Figure 4. NASA Updated FY 2008 Scope 1 & 2 GHG Emissions Baseline for Reduction Targets (MtCO₂e / % of total emissions)

NASA utilized existing data from the NETS database on Center-level data on energy, fleet, and fugitive sources and the DOE FEMP Portal Tool, as directed by the current guidance to yield the FY 2010 GHG Scope 1 and 2 emissions inventory of 1,347,115.5 MtCO₂e. Figure 5 characterizes the categories and their related GHG emission estimates.

Figure 5. NASA FY 2010 Scope 1 & 2 GHG Emissions Inventory (MtCO₂e / % of total emissions)

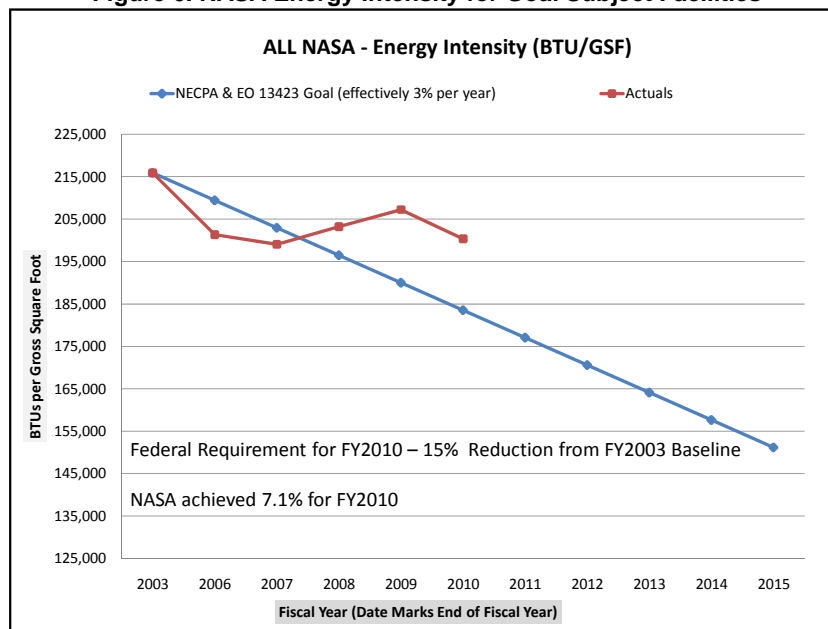
Energy and Buildings

Goal 1. Element b.1 - Reduce Facility Energy Intensity

[Reduce facility energy intensity – Reduce energy consumption per gross square foot of building area by 3% annually from FY 2003 baseline for FY 2006 – FY 2015 (30% Total) (EO 13423) following the per FY reductions mandated in EISA 2007]

NASA reported energy intensity reductions of 7.1% below the FY 2003 baseline for FY 2010; substantially less than the required 15% (see Figure 6). However, NASA did reduce energy intensity by 3.1% in FY 2010, thus meeting the annual requirement of 3% reduction per EO 13423.

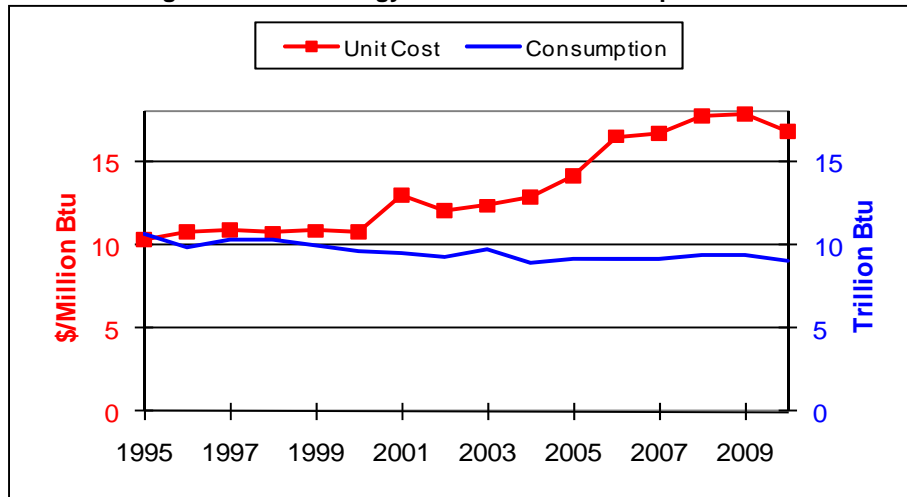
Figure 6. NASA Energy Intensity for Goal Subject Facilities



High energy and fuel costs are identified as significant risks to mission at NASA and Facility Energy Consumption is identified as a high risk in the Agency's Active Risk Management (ARM) system. NASA is implementing energy efficiency and conservation as an integral part of the Agency's institutional strategy, fully aware that investing in energy use reductions, renewable energy, and other innovative approaches will reduce GHG emissions. The SSO has clearly identified that NASA's projected GHG emission reductions result from cutting energy use and intensity, an important by-product of investing in energy reductions and renewable energy or other innovative approaches.

Since 1995, energy unit costs have increased 63%, with an average yearly increase of 6% since FY 2000. The trend in Figure 7 illustrates that NASA is buying less energy yet spending more. Projects and ideas deemed not cost effective 6 to 10 years ago may now have a more attractive rate of return. NASA spent \$109M in FY1995 on energy and \$153M in FY 2010, despite consumption reductions. Had NASA's consumption remained the same in FY 2010 as in FY 1995, NASA would have spent \$179M.

Figure 7. NASA Energy Unit Cost vs. Consumption Trend



Limited past and current investment resources prevent NASA from achieving required federal energy reduction targets in the timeframe required.

- The Agency's five year Facility Recapitalization forecast \$2B from FY13-FY17 to upgrade aging infrastructure and reduce energy consumption. As noted in Section 1.2, NASA's plan to increase its capital investments is not supportable in the current budget environment, and NASA is scaling back plans to renew, consolidate, and reduce the consequences of our activities on the natural environment. The Agency has only begun to quantify and evaluate the implications of these changes, and expects to revisit its strategies in response.
- NASA's senior leadership committed \$22M of FY 2012 Strategic Institutional Investment (SII) funding to energy efficiency projects. Additional funding of at least \$138M would be required for energy specific investments over FY12 to FY20 for the Agency to meet energy and GHG emissions reduction targets by 2020. In order for the Agency to meet the required energy reduction targets by 2015, the \$138M Incremental Investment budget would need to be increased to \$180M budgeted between FY12 and FY15. NASA submitted an over-guideline request with the FY 2012 Budget to OMB.
- In response to current budget circumstances, planned FY 2011 SII funding for energy conservation measures has been reallocated and no NASA HQ funding commitments will be made for energy specific projects in FY 2011.

Upcoming changes in the NASA mission provide challenges to forecasting energy reduction performance beyond 2012. The scheduled retirement of the Shuttle program in FY 2011 and the phase out of the Constellation Program in 2011 may cause a reduction in energy consumption when facilities that support these programs are closed down or transitioned to support future activities. New mission directions may result in unforeseen changes in energy use. For example, NASA may achieve minimal energy consumption reduction if new programs move into the buildings the Shuttle program vacates and the anticipated energy use reduction does not occur.

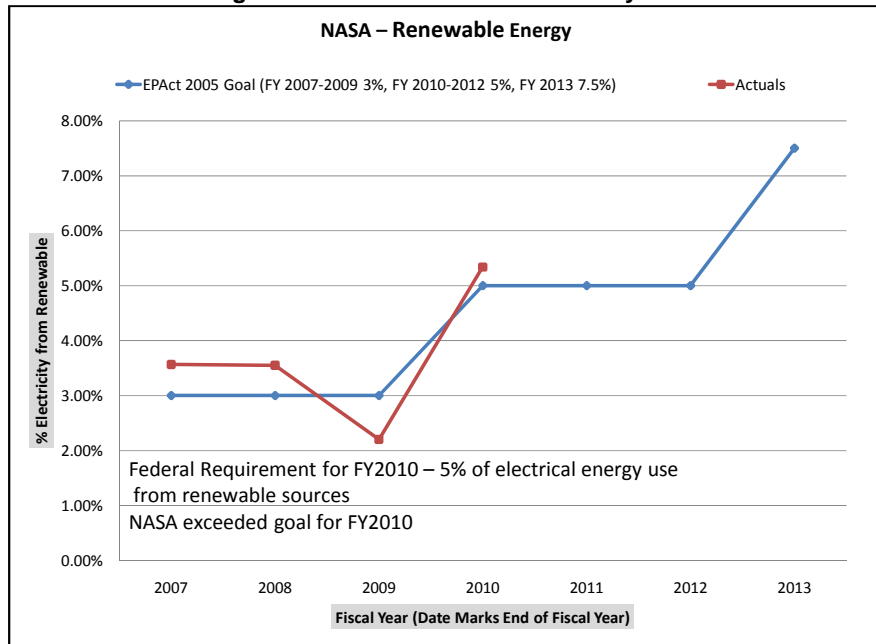
NASA will continue to invest in infrastructure upgrades that result in energy efficiency, provided adequate funding and resources are available.

Goal 1. Element b.2 - Increase Renewable Electricity Installation & Use

[i. Increase percentage of total electricity from renewable sources (3% FY 2007 – FY 2009; 5% FY 2010 – FY 2012; 7.5% FY 2013+); ii. Strive for at least half of the renewable energy from new renewable sources (placed into service after January 1, 1999)]

In FY 2010, the Agency exceeded the required target as illustrated in Figure 8. Electricity from renewable sources for FY 2010 was 6.4% - as opposed to 5% - and over 50% of the renewable energy came from new renewable sources.

Figure 8. NASA Renewable Electricity Use



Highlights include:

- NASA Langley Research Center (LaRC) constructed a 39.5 kilowatt (KW) photovoltaic (PV) system for the Badge and Pass Office which will produce approximately 50% of the building's annual energy needs.
- The NASA White Sands Test Facility (WSTF) installed 55KW solar panels at the 100 Area parking lot to generate electricity for the Columbia Fitness Center and at the same time provide shade for parking, which is very welcome in the Southwest region.

Goal 1. Element b.3 - Reduce per capita energy consumption through space management

NASA reduces energy consumption through space management policies as stated in NPD 8800.14D section 1a, "It is NASA policy to promote the efficient and economical utilization of its real property assets." NASA NPR 8800.15B, Chapter 5, discusses the details of facilities utilization, including the establishment of the facilities utilization officer, requirements for annual reviews and reports, and space allowance standards. In addition, NASA master planning guidance requires all NASA Centers to reduce their footprint by 15% by 2050.

Fleet

Goal 1. Element c.1 - Reduce Petroleum Use in Fleet Vehicles

[Reduce petroleum use 2% annually from FY 2005 baseline for FY 2005 – FY 2020 (30% Total)]

NASA continues to meet the annual petroleum fuel reduction goal of 2% per year since 2005, exceeds the 2010 10% reduction goal with an actual reduction of 19.5%, and is on schedule to meet the 2020 reduction goal of 30%. Due to anticipated changes in NASA's mission such as Space Shuttle retirement and phase out of the Constellation Program, the NASA fleet is expected to decrease by 500-700 vehicles over the next several years.

Goal 1. Element c.2 - Increase Use of Alternative Fuels in Alternative Fuel Vehicles (AFVs) and Flex-Fuel Vehicles (FFVs)

[Increase alternative fuel use by 10% annually from 2005 baseline for FY 2005 – FY 2015]

Each Center has alternative fuel capability and non-alternative fuel leased vehicles will be phased out following the General Services Administration (GSA) replacement schedule (e.g., 75% of changed out vehicles per year have to be to alternative fuel vehicles). In FY 2011, 283 vehicles will be replaced with alternative fuel vehicles. NASA continues to develop on-Center alternative fuel infrastructure in support of increasing AF usage in AFVs, including new E85¹⁰ aboveground storage tanks (ASTs) located in Ohio and Alabama, completed in FY11. Additional NASA Centers are piloting the use of solar panel assisted Low Speed Electric Vehicles (LSEVs) and/or their charging stations to determine the effect on extending battery life and reductions on electrical draw.

¹⁰ Flex fuel: mixture up to 85% denatured fuel ethanol and gasoline.

Goal 1. Element c.3 - Optimize Use of Vehicles and Right-Size Fleet

NASA's vehicle optimization strategy led to the reduction of 99 petroleum-dedicated fueled vehicles in FY 2010. The strategy includes: a) an Agency requirement for the use of "Vehicle Utilization Review Boards" (VURBs) to review, maintain, and approve requests for vehicle assignments; b) the VURB must meet annually to conduct a review of all existing vehicle resources; and c) the VURB considers taxi service, shuttle bus, Privately-Owned Vehicle use, Vehicle Pools, rental vehicles, the downsizing of petroleum dedicated vehicles and the use of LSEVs as tools to assist in the management of vehicle resources d) each Center Director plays an active role in the management of vehicle resources within their authority.

Goal 1. Element c.4 - Increase Use of Low Emission and High Fuel Economy Vehicles

NASA annually replaces leased non-AFVs with AFVs at a rate higher than required by EO 13423. These vehicles meet DOE low emission and higher fuel efficiency standards. When a non-Low Emission/High Fuel Economy vehicle is necessary, each request is required to be-certified with "functional requirement waivers." In FY11, of the 283 vehicles that will be replaced, 83 of them will be low GHG emitting vehicles (hybrids and AFVs).

Goal 1. Element c.5 - Replace Conventional Senior Executive Fleet with Low-Emitting, Highly-Efficient Vehicles

NASA's conventional executive fleet consists of two (2) commercial leased full size sedans. NASA's goal to replace the senior executive fleet is to reduce by 50% the current fleet in FY 2013 and completely exchange the fleet by 2015.

Goal 1. Element c.6 - Agencies operating shuttle buses should discuss challenges related to consolidation of and/or sharing of transportation services with other agencies

NASA does not currently have anything to contribute to this discussion. NASA does not support a shuttle service within the DC/Baltimore Metro Area. NASA Centers use shuttle buses to transport visitors throughout Centers and transport employees between mass transit and Center properties.

Goal 1. Element c.7 - Discuss Agency's efforts to implement sustainable transportation options

NASA's current fleet contains 3741 vehicles, of which:

- 1763 are either Hybrids or AFVs.
- 1273 petroleum dedicated vehicles (down 99 from 2009).
- 589 diesel vehicles using B20¹¹.
- 116 electric vehicles.

NASA's efforts to infuse low GHG emitting vehicles into the vehicle fleet include:

- Low GHG emitting
 - 30 hybrids, including 18 hybrids acquired in 2010, and 17 additional vehicles scheduled for 2011.
 - 1739 AFVs, including 150 acquired in 2010 and 83 additional low GHG AFVs scheduled for 2011.
- Zero GHG emitting
 - 116 electric vehicles, including 47 electric vehicles acquired in 2010.

Use of VURBs at each NASA Center to optimize vehicle resources, including reduction, right sizing and use of vehicle pool considerations led to a reduction of 99 petroleum dedicated vehicles in 2010.

- NASA established a policy of mandatory alternative fuel use for all vehicles capable of using alternative fuels, including the use of B20 in all Diesel vehicles, when available. NASA has developed alternative fuel infrastructure at 12 of 13 NASA locations, including E85, compressed natural gas (CNG), liquefied petroleum gas (LPG), B20, and electric charging stations.
- NASA plans to pilot solar assisted LSEVs and charging units, and increase the number of locations providing AFV by two additional sites.

NASA has specific challenges in implementing sustainable transportation actions:

- Alternative Fuel Vehicles often incur "incremental fees" unlike the equivalent models without alternative fuel abilities, thus increasing the bottom line costs of NASA's vehicle fleet.
- Alternative fuels are less efficient than gasoline, thus causing the use of more fuel to perform the same functions, thus increasing the bottom line costs of NASA's vehicle fleet.
- As private industry prolongs the investment in commercial infrastructure, NASA's development of alternative fuel infrastructure is an additional cost burden, thus increasing the bottom line costs of NASA's vehicle fleet.
- CNG compressor pumps require VERY high dollar maintenance support and NASA has had to replace entire compressors, at over \$100,000 each, and the some compressors have required replacement multiple times.

¹¹ 20% biodiesel; 80% petrodiesel

- As NASA continues efforts to optimize its vehicle fleet in relation to mission changes, those efforts may include the reduction of alternative fueled vehicles, as most vehicle consolidations and reductions occur in the administrative fleet. In contrast, the majority of the petroleum dedicated vehicle fleet tends to be in the heavy duty arena, where commercially available alternative fuel options are limited. With potentially fewer AFVs in the fleet, NASA's ability to increase alternative fuel usage to meet EO 13514 goals could become more difficult.

2.1.5 Positions

GHG Emissions - NASA civil servants at HQ and the Centers generally address aspects of GHG emissions management through the execution of a broad range of Agency programs. All NASA Centers provide key Center-specific data to the NETS database that NASA HQ uses to form the basis of GHG emission reporting and tracking. Several Centers also have staff that address state-specific GHG reporting and may employ contractors to support state-specific GHG reporting efforts. NASA-wide, current staffing levels meet current requirements.

Due to the rapidly evolving and expanding nature of GHG requirements, NASA recognizes the need to continue to improve communication, information and coordination from NASA HQ to best leverage existing resources NASA-wide. NASA initiated and plans to continue to expand outreach across existing communities of practice in the related Agency programs and to utilize new electronic tools and means of communication. As requirements and guidance evolve and change, NASA will evaluate whether additional staff resources are needed.

Energy and Buildings - Currently, designated energy managers at the Centers manage energy requirements as a portion of their assigned duties. Due to increased requirements and expanding reporting, additional staffing at some Centers is necessary and additional FTEs or contractor support will be considered, depending on funding availability.

Fleet - Current staffing levels, in general, are adequate across the Agency with the exception of KSC. KSC currently has the largest fleet among the NASA Centers and is expected to have a significant reduction in fleet size due to the end of the Shuttle mission. This reduction will require the additional support of at least one additional FTE to help with the transition to fewer vehicles. This position was filled in early FY 2011 and will perform required functions as the Shuttle program closes down in late FY 2011.

2.1.6 Planning Table

SCOPE 1 and 2 GHG TARGET		Unit	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Energy & Buildings	Energy Intensity Reduction Goals (BTU/SF reduced from FY 2003 base year)	%	18	21	24	27	30	hold	hold	hold	hold	hold
	Planned Energy Intensity Reduction (BTU/SF reduced from FY 2003 base year)	%	10	13	15	18	20	22	24	26	28	30
	Renewable Electricity Goals (Percent of electricity from renewable sources)	%	5	5	7.5	hold	hold	hold	hold	hold	hold	hold
	Planned Renewable Electricity Use (Percent of electricity from renewable sources)	%	5	5	7.5	hold	hold	hold	hold	hold	hold	hold
Fleet	Petroleum Use Reduction Targets (Percent reduction from FY 2005 base year)	%	12	14	16	18	20	22	24	26	28	30
	Planned Petroleum Use Reduction (Percent reduction from FY 2005 base year)	%	12	14	16	18	20	22	24	26	28	30
	Alternative Fuel Use in Fleet AFV Target (Percent increase from FY 2005 base year)	%	77	95	114	136	159	hold	hold	hold	hold	hold
	Planned Alternative Fuel Use in Fleet AFV (Percent increase from FY 2005 base year)	%	77	95	114	136	159	hold	hold	hold	hold	hold
	Senior Executive Fleet Replaced with Low-GHG, High Efficiency Vehicles (Percent replaced from FY08 base year)	%	0	0	50	50	100	hold	hold	hold	hold	hold
Greenhouse Gas Emission	EO 13423 Toxic & Hazardous Chemical Plan Goal: Reduce Agency's GHG emissions intensity by 1% annually or a total of 9% by FY 2015 from FY 2003 baseline	%	1	1	1	1	1	hold	hold	hold	hold	hold
	Total Scope 1&2 GHG Emissions (Comprehensive)	MMTCO ₂ e*	1.294	1.274	1.253	1.232	1.212	1.191	1.170	1.150	1.129	1.108
	Total Scope 1&2 GHG Emissions (Subject to Agency Scope 1&2 GHG Reduction Target)	MMTCO ₂ e*	1.294	1.274	1.253	1.232	1.212	1.191	1.170	1.150	1.129	1.108
	Scope 1&2 Reduction Target (reduced from FY 2008 base year)	%	1.525	1.525	1.525	1.525	1.525	1.525	1.525	1.525	1.525	1.525
	Overall Agency Scope 1&2 Reduction (reduced from FY 2008 base year)	%	4.58	6.1	7.63	9.15	10.68	12.2	13.73	15.25	16.78	18.3

*While the text refers to MtCO₂e, this unit is MMTCO₂e to align with the prescribed template.

2.1.7 Implementation Methods

NASA's success depends not only on Agency mission program success, but also on building and maintaining a strong and sustainable infrastructure and reducing fossil fuel use. Energy and fuel costs are eroding mission funding and even though NASA has been gradually reducing energy use over the past few years, costs have been increasing sharply due to the significant increases in the unit cost of energy (see Figure 8).

Additionally, addressing GHG emissions at NASA requires integrative responses as the data, resources, requirements and opportunities need to be coordinated and managed by a range of offices and organizations. GHG management is often a direct result of action and investments in NASA to address other significant requirements, thereby making it difficult to segregate GHG efforts from the larger sustainability effort.

GHG Emissions

NASA estimates, for Scope 1 and 2 GHG emissions, a 2% annual reduction over FY12-FY17 and a 1% annual reduction in FY 18-FY20, tracking with projected energy and fossil fuel (fleet) reductions; this should yield total GHG emission reductions of 18.3% from FY10-FY20.

Energy and Buildings

Strategies to meet federal requirements include continued implementation of high performance sustainable building design and construction principles, improved management of existing building systems, and identification of alternatives to renovation that reduce existing asset deferred maintenance costs. When adding assets to Agency building inventories, opportunities are identified to consolidate and eliminate existing assets, optimize the performance of portfolio property, and reduce associated environmental impacts.

Reduce Facility Energy Intensity

NASA is implementing the following projects to improve energy efficiency and increase use of renewable energy.

- NASA Wallops Flight Facility (WFF) awarded a \$14.2M Energy Savings Performance Contract (ESPC) in FY2010 to “decentralize central heating system, building level HVAC and controls modifications in 13 buildings, and upgrade interior and exterior lighting to more efficient lighting systems.” The project is expected to reduce WFF’s energy intensity by 35%; reduce water consumption by 5% due to eliminating make-up water at central plant; reduce emissions: sulfur oxide (Sox) 99%, nitrogen oxide (NOx) 50%, carbon monoxide (CO) 39%, volatile organic compounds (VOCs) 17%, particulate matter 80%. This project will replace the legacy central steam plant in its entirety and replace #6 oil fuel with propane. The project is estimated to be completed by end of FY2011.
- NASA Goddard Space Flight Center (GSFC) awarded a \$4.1M ESPC to retro-commission HVAC systems and replace inefficient lighting with latest lighting technology, such as T-5 lighting. The project will be completed in FY2011.
- NASA Ames Research Center (ARC) awarded a \$23.2M Utility Energy Service Contract (UESC) that involves more than 100 buildings and facilities covering the NASA ARC Campus, the NASA Research Park, and Eastside Airfield. The scope of work includes lighting upgrades, HVAC upgrades, boiler replacements with 32 new low NOx boilers, steam boiler improvements, retro-commissioning of 7 buildings combined with energy management control system upgrades, water conservation measures, and a 95KW PV solar system. The project is expected to result in \$2M energy savings per year.
- NASA Jet Propulsion Laboratory (JPL) awarded to CEG a \$6.2M Super Energy Savings Performance Contract early CY 2011 to perform HVAC system energy efficiency upgrades in 3 buildings. The upgrades include: 2 chiller replacements; 1 boiler replacement; and waterside and airside efficiency upgrades from fixed flow to variable flow. This ESPC includes lighting upgrades in 20 buildings, a major portion of the task will retrofit inefficient T12 lights and ballast and low efficiency T8 to high efficiency T8 lights and ballast. Also included as a cost savings measure the main water meter will be upsized to a 10" meter which will allow for a lower rate per gallon. The expected annual cost savings for this project is \$426,000.

NPR 8570, *Energy Efficiency and Water Conservation*, directs NASA HQ, Centers, Component Facilities, Strategic Enterprises, and Institutional Program Offices to implement the requirements of federal law, EOs, and NASA policy related to energy efficiency and water conservation. Energy performance data are reported quarterly in NETS.

NASA strategy is to initiate feasibility studies for large projects that will effectively reduce energy use across the Agency. NASA also plans surveys to evaluate existing energy management control systems at Centers in order to optimize systems and building performance for energy efficiency.

NASA’s success on future initiatives depends on funding sources being available, which include Agency funding, third party investments, and Enhanced Use Lease (EUL) authority.

NASA is experiencing shifts in mission requirements and related activities at the Centers that may impact energy management. In addition, the Agency has seen increased energy use in the areas of computer and super computer use. Large data centers are affecting energy performance and energy conservation measures are not sufficient to counteract the increasing loads.

Renewable Electricity Installation & Use

NASA is achieving its renewable energy goal primarily through procurement of Renewable Energy Certificates (RECs) and in FY 2010, for the first time, NASA procured RECs at the Agency level to ensure the Renewable Energy goal was met.

NASA performed an Agency-wide renewable energy resource assessment and is now working to determine the best options for on-site renewable energy generation. Under consideration are KSC, Johnson Space Center (JSC) – White Sands Test Facility (WSTF), Dryden Flight Research Center (DFRC), and at Oak Grove and the Goldstone Deep Space Communications Complex. The Agency is planning to invest \$10M from NASA’s FY12 SII budget for construction of solar arrays at the WSTF and DFRC for an estimated cost of \$5M each. Installation of solar panels on

NASA facility roofs is also under consideration. Several projects also propose to incorporate a small solar project within major projects, such as the UESC at ARC and a planned parking garage at JPL.

NASA has submitted a legislative request to expand NASA's EUL authority to allow in-kind consideration for large scale renewable energy projects. The White Sands Test Facility offers opportunities of approximately 100MW of PV solar on NASA land. Much larger solar opportunities are possible if NASA, the Bureau of Land Management, and the State of New Mexico combine land resources in the WSTF buffer zone to develop renewable energy resources. EUL authority will enable NASA to take advantage of renewable resources at WSTF, KSC, and other prime locations such as:

- Large solar installations at WSTF, KSC, Glenn Research Center-Plumbrook Station (GRC-PBS), LaRC and JSC.
- Wind installations at GRC-PBS and WSTF.

NASA is successfully using several renewable energy technologies currently not counted in the renewable energy metric. NASA is installing geothermal heat pumps and solar thermal throughout the Agency, but because these systems do not produce electricity, they do not contribute to the renewable energy metric. The renewable energy metric does not include geothermal if geothermal is not used specifically for generating electricity. NASA uses landfill gas at GSFC and waste to energy at LaRC, which also do not count toward the renewable energy metric. The federal family could be contributing more to the demand and use of renewable energy if these types of activities were included in the renewable energy metric.

NASA did not receive any American Reinvestment and Recovery Act (ARRA) funding for the implementation of renewable energy projects. The Agency-wide renewable energy resource assessment noted above may provide access to more 'shovel-ready' projects if stimulus funds and/or other types of funding were to become available.

Fleet

NASA will continue to eliminate underutilized vehicles, right-size the fleet, and increase the acquisition of low and zero GHG emitting vehicles. These efforts are aided by the Vehicle Utilization Review Boards (VURBs) at the NASA Centers which determine the optimization and right sizing of vehicles based on the mission assigned. NASA anticipates the following activities in FY11 through FY13:

- **FY 2011:**
 - Turn-in and pre-elimination of vehicles associated with Shuttle program and other projects. The majority of vehicle reductions will occur in this FY, reducing operating costs along with a significant decrease in petroleum use and a reduction of some alternative fuel use.
 - Activate two alternative fuel storage tanks at two NASA Centers, increasing alternative fuel use while directly reducing the need to request EPA 701 waivers.
 - Agency review of all replacement GSA leased vehicles to maximize acquisition of AFVs and low GHG emitting vehicles.
 - Agency review of Center-certifying functional waivers.
 - Use of Vehicle Utilization Review Boards at NASA Centers:
 - to review and concur with current vehicle justification of assignments.
 - approve or disapprove request for additional vehicles.
 - take actions to increase vehicle utilization among those vehicles deemed not fully optimized.
- **FY 2012:** Minor vehicle reductions will occur in this FY, with the leveling off and stabilizing of vehicles and cost numbers.
- **FY 2013:** Minor vehicle reductions will occur in this FY, with the leveling off and stabilizing of vehicles and cost numbers. Adjustments to contract language passing Agency petroleum reductions and alternative fuel usage goals onto NASA contractor(s) and their subcontractors.

2.1.8 Return on Investment

No significant projects or initiatives included in the previous year's SSPP have been deliberately cancelled or suspended due to a lower than expected return on investment (ROI). Likewise, no specific projects or initiatives have been expanded due to higher than expected return on investment (ROI).

2.2 GOAL 2 - SCOPE 3 GREENHOUSE GAS REDUCTION & DEVELOP AND MAINTAIN AGENCY COMPREHENSIVE GREENHOUSE GAS INVENTORY

NASA established its Scope 3 GHG emissions reduction target of 12.3%, based on an initial FY 2008 baseline estimate of 118,104.6 metric tons of carbon dioxide equivalent (MtCO_{2e}) across its institutional portfolio. Development of NASA's initial baseline and projected GHG reduction target followed the guidance in the early stages

of implementing EO 13514, based on the results of a Scope 3 Target Tool. The preliminary analysis covered only limited Scope 3 categories. Current guidance clarified and expanded the reporting requirements, resulting in the updated FY 2008 baseline and FY 2010 inventory. Currently, including allowances for renewable energy use, the updated FY 2008 baseline for Scope 3 estimated emissions total is 171,277.4 MtCO₂e. As with Scopes 1 and 2, energy intensity reduction efforts will reduce Scope 3 emissions. However, other efforts target non-energy related GHG emissions.

2.2.1 Goal Description

- a. Reduce Scope 3 GHG emissions by 12.6% by 2020.
- b. Reduce Scope 3 GHG emissions associated with contracted waste disposal by 23.1% by 2015, excluding C&D waste.
- c. Reduce Scope 3 GHG emissions associated with T&D losses from purchased energy by 15.1% by 2020.
- d. Discuss methods used by NASA to calculate its Scope 3 GHG emissions and to continually improve data accuracy and overall data collection and analysis methods.
- e. Track Federal employee travel (business travel and commuting) and other emerging Scope 3 GHG emission sources to identify opportunities for future reductions.
- f. Complete annual NASA comprehensive GHG inventory and discuss development of NASA's FY 2010 GHG inventory.

2.2.2 Agency Lead for Goal

Agency Lead: James Leatherwood, Director; Environmental Management Division

Goal Manager: Linda Wennerberg, Ph.D., Senior Environmental Scientist; Environmental Management Division

2.2.3 Highlights

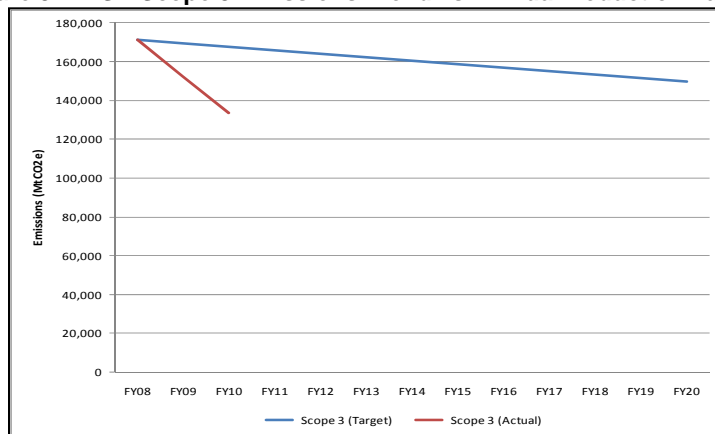
NASA developed a short, targeted commuting survey which was provided electronically to all NASA civil servants. NASA achieved a 30% response rate for this voluntary survey. The survey generated significant interest with over 20% of the responders volunteering for future efforts on commuting and GHG reduction issues at their NASA Center.

2.2.4 Agency Status

Goal 2. Element a - Reduce Scope 3 GHG emissions by 12.6% by 2020

NASA achieved the established 12.6% 2020 Scope 3 GHG reduction target, set in 2010 (see Figure 9). NASA achieved significant reductions in Scope 3 emissions due to severe limitations and reductions on air travel imposed upon NASA that generated a major reduction in estimated GHG emissions which is not likely to be sustainable over time.

Figure 9. NASA Scope 3 Emissions Trend vs. Annual Reduction Targets



Goal 2. Element b - Reduce Scope 3 GHG emissions associated with contracted waste disposal by 23.1% by 2015

NASA is on track to meet the established 23.1% by 2015 Scope 3 GHG reduction target associated with contracted waste disposal, set in 2010.

Goal 2. Element c - Reduce Scope 3 GHG emissions associated with T&D losses from purchased energy by 15.1% by 2020

NASA is on track to meet the established 15.1% by 2020 Scope 3 GHG reduction target associated with T&D losses from purchased energy, set in 2010.

Goal 2. Element d - Discuss methods used by NASA to calculate its Scope 3 GHG emissions and to continually improve data accuracy and overall data collection and analysis methods.

NASA utilized the FEMP Portal Tool to calculate an expanded 2008 Baseline and develop the 2010 Inventory of Scope 3 GHG (see Figures 10 and 11). Scope 3 GHG emissions included employee travel (air and ground transportation), employee commuting, T&D loss estimates from purchased electricity, contracted solid waste disposal, and offsite wastewater treatment using approved approaches. NASA utilized existing Center data reported in NETS, as well as data on employee travel provided by GSA to calculate Scope 3 GHG emissions. Using the GSA/DOT commuting survey as a basis, NASA developed and conducted a shortened commuting survey online for all NASA civil servants. NASA also verified civil servant population numbers with internal Human Resources and compared the inventory against the 2010 SSPP Scope 3 data reporting. NASA utilized third party verification through the use of contractors and provision of the GHG estimates to DOE for review, prior to submission of the final Scope 3 GHG inventory.

Goal 2. Element e - Track Federal employee travel (business travel and commuting) and other emerging Scope 3 GHG emission sources to identify opportunities for future reductions.

See Goal 2, Element d.

Figure 10. NASA Scope 3 GHG Emissions Breakdown (2008 Baseline for Reduction Targets) (metric tons / % of total Scope 3 emissions)

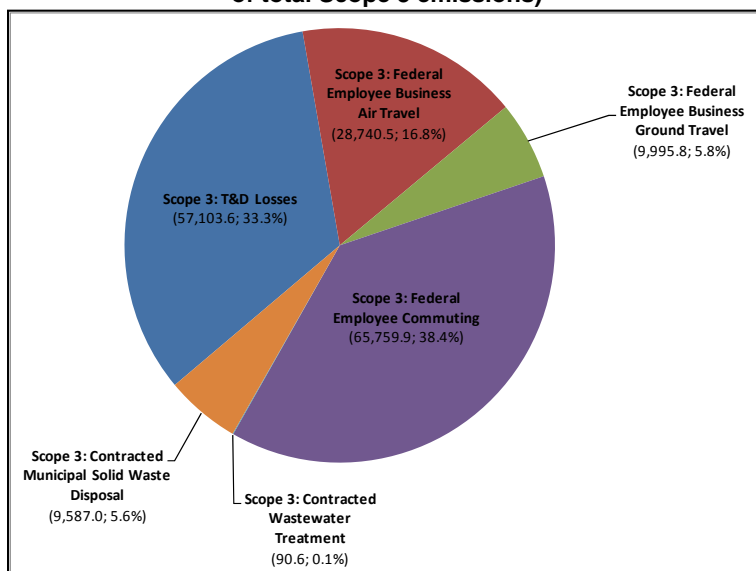
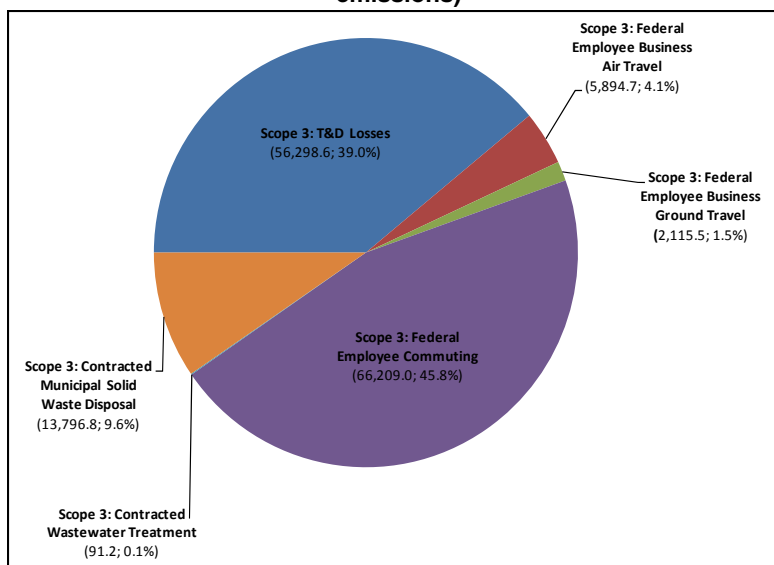


Figure 11. NASA Scope 3 GHG Emissions Breakdown for 2010 Inventory (metric tons / % of total Scope 3 emissions)



As NASA receives guidance on requirements to continue to inventory Scope 3 GHG emissions, the Agency will continue to examine and improve data accuracy, and overall data collection and analysis methods. Particular data challenges and activities identified to date include the following.

Federal employee travel

Federal employee travel has three components; GSA has provided NASA the means to track two of those components thus far – business air travel and business ground travel. To develop the updated 2008 baseline and the 2010 inventory, NASA utilized data provided by GSA on NASA air and ground travel, an option provided to many participating agencies. For the third component – employee commuting – NASA, as planned, developed and undertook civil servant surveys on employee commuting and teleworking to estimate Scope 3 GHG emission for the updated 2008 baseline and 2010 inventory.

NASA will continue to collect and maintain data on employee travel and commuting in conformance with evolving guidance. NASA will also evaluate options to encourage employee travel activities that lessen GHG emission through innovative programs to select Energy Star accommodations, prefer nonstop or limited stop flights, use of alternative electronic meeting tools such as Webinars or video conference sessions, and solicit employee suggestions on alternative approaches to minimize NASA's Scope 3 GHG emissions related to employee travel.

Contracted Solid Waste

NASA currently applies an internal annual solid waste diversion goal of 35% by 2010 that was met by attaining 36% in 2010 (see Goal 5). NASA is on track to achieve the new EO requirement to achieve a solid waste diversion goal of 50% for both contracted solid waste disposal and C&D waste between FY10 through FY15. NASA utilized overall solid waste generation volumes reported by the Centers in the NETS database to establish the contracted solid waste volume, as per the guidance to set the 2008 baseline and the 2010 inventory. The solid waste generation data in NETS provide general information and is not yet configured to accommodate the necessary detail for development of a credible and traceable GHG baseline calculation and annual inventory. The 2008 NETS data for contracted solid waste disposal is not representative, due to NASA's experience that contracted solid waste disposal may exhibit significant levels of fluctuation on an annual basis due to mission changes.

To address this, NASA calculated an average annual contracted solid waste disposal volume by summing up the appropriate NETS data for the past 10 years (up to 2008) for the 2008 baseline. This calculated average solid waste volume addressed potential gaps in the reported historic NETS data. For example, details are not readily available to clearly delineate the C&D portion in solid waste. In the calculation of the updated 2008 Baseline, NASA subtracted any known C&D waste volume and known onsite solid waste disposal from the total solid waste generated. NASA applied guidance and updated its data systems and Centers reporting to support segregation of separate data elements to promote accurate reporting for the 2010 inventory. This will allow tracking of onsite and offsite solid waste disposal and volume of C&D waste.

Transmission and Distribution losses from purchased energy

NASA utilized its NETS data on purchased electricity and the FEMP Portal Tool to calculate the updated 2008 baseline and 2010 inventory estimating GHG emissions related to T&D losses. NASA plans to achieve the required reductions in purchased electricity by 2020 and, therefore, achieve related energy and GHG emissions reductions by meeting its regulatory requirements.

Goal 2. Element f - Complete annual NASA comprehensive GHG inventory and discuss development of NASA's FY 2010 GHG inventory.

Building on NASA's experience with an internal GHG emissions inventory tool and application of existing NETS energy data, NASA continues to use and expand its existing NETS database to support calculations of GHG emissions using the DOE FEMP Portal Tool, as required by current guidance. NASA originally developed its internal GHG emissions inventory tool to track and report reductions of a GHG intensity reduction goal, a goal NASA developed in response to EO 13423. This provided a solid benchmark to evaluate current inventory reporting under the Portal Tool. Due to the expanded target for GHG reduction set by NASA for Scopes 1, 2, and 3 under EO 13514, NASA will no longer conduct a separate inventory process or annual report conforming to EO 13423 to address the previously set, internal NASA-specific GHG reduction goal only for limited Scopes 1 and 2. In NASA's 2010 SSPP, plans were provided to shift efforts to address EO 13514 and its guidance; that transition is now completed.

NASA provided detailed comments and input to the DOE FEMP Portal Tool development team. This includes testing the draft Tool with verified 2008 data and sharing the results with the Tool's team. In addition, NASA shared its draft final energy and GHG calculations with the Tool's development team prior to the submission deadline to further support testing of the Tool.

NASA is currently actively supporting interagency working groups targeting improvements in the existing guidance and plans to continue participation in interagency review and comment process. To address evolution of the guidance and changing data needs, NASA HQ will undertake an annual review of current guidance and requirements to update the NASA inventory process and the supporting NETS data base.

2.2.5 Positions

Refer to Positions discussion in Goal 1.

2.2.6 Planning Table

SCOPE 3 GHG TARGETS	Unit	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Total Scope 3 GHG Emissions (Comprehensive)	MMTCO ₂ e*	0.1660	0.1643	0.1625	0.1607	0.1590	0.1572	0.1555	0.1537	0.1520	0.1502
Total Scope 3 GHG Emissions (Subject to Agency Scope 3 GHG Reduction Target)	MMTCO ₂ e*	0.1660	0.1643	0.1625	0.1607	0.1590	0.1572	0.1555	0.1537	0.1520	0.1502
Overall Agency Scope 3 Reduction (reduced from FY08 base year ¹)	%	3.08	4.1	5.13	6.15	7.18	8.2	9.23	10.25	11.28	12.3
Overall Agency Scope 3 Reduction Target (reduced from FY08 base year)	%	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025

*While the text refers to MtCO₂e, this unit is MMTCO₂e to align with the prescribed template.

2.2.7 Implementation Methods

In FY 2011 and FY 2012, NASA plans to continue Agency activities and policy implementation to address evolving formal Guidance and/or Technical Support Document requirements for estimating and reporting Scope 3 emissions. Scope 3 emissions are generated by a range of operations to the energy activities tracked under Goal 1. NASA Centers, as discussed in Goal 1, will track and report specific data into the NETS data system that will be utilized by HQ staff for annual reporting and prioritization through the application of the DOE FEMP Portal Tool. In keeping with the current guidance, NASA updated its NETS reporting, where possible, to address evolving reporting requirements. In addition, existing data held by NASA and external data sources, such as GSA, will be utilized, where appropriate with the Portal Tool.

As identified in Scopes 1 and 2 (Goal 1 discussion), the success of Scope 3 GHG emission reductions at NASA will often be a direct result of action and investments at NASA to address other requirements, thereby making it difficult to segregate GHG from the larger sustainability effort. For example, actions to address data center consolidation, sustainable acquisition, real property consolidation, and promotion of sustainable buildings would likely impact Scope 3 emissions estimates as would expansion of the Scope 3 baseline with new GHG sources. With additional guidance, NASA plans to promote integrative responses as the data, resources, requirements, and opportunity involve a range of offices and organizations.

Integration

NASA plans to continue to build and execute a GHG inventory process and supporting NETS database (and other relevant data sources) that ensures compliance with EO 13514 requirements and other significant federal actions, such as EPA's requirements for reporting under the MRR, where appropriate. NASA initiated updates to NETS to help integrate Center energy, solid waste, and infrastructure management information so that it will be available to HQ and Center decision makers. As requirements change, NASA plans to review the options to conduct an overall update of NETS to promote increased access to the ranges of applicable data across the Agency and support ready integration.

Methods to Obtain Reliable Performance Data

Currently, the NETS database and related Infrastructure and Facilities databases provide Center-level data for aggregation and reporting by NASA HQ that supports credible Energy, Water, and EMS Scorecards. NASA intends to continue to build on and improve its existing databases to address new and emerging GHG management and reporting requirements. Current plans build on supporting data collection at the Center level with subsequent verification and aggregation at HQ for Agency-wide reporting, and include quality assurance performed by HQ staff

prior to reporting. NASA plans to continue this interactive process to ensure quality, accountability and traceability of all the underlying data in FY 2011 and FY 2012.

Process for Evaluation and Revision

NASA plans to continue to actively track evolving requirements for GHG management and specifically the annual inventory and reporting guidance. Due to the rapidly evolving nature of GHG management, NASA HQ staff, working with identified Center leads and the NASA RRAC Principal Center, will identify and disseminate pending regulatory or policy changes subject to interagency comment and review, as well as new requirements across the range of applicable communities of practice, and undertake updates to existing policies or practices on an as needed basis.

Using the established NASA EMS/risk management process, NASA HQ staff will work with Center leads to address emerging GHG requirements or issues. NASA plans to continue to use the EMS process to address current and changing GHG requirements, communicate targets and set priorities.

2.2.8 Return on Investment

NASA currently has no projects or initiatives formally targeting GHG emission reductions.

2.3 GOAL 3 - HIGH-PERFORMANCE SUSTAINABLE DESIGN / GREEN BUILDINGS & REGIONAL AND LOCAL PLANNING

2.3.1 Goal Description

High-Performance Sustainable Design / Green Buildings

- a. Beginning in FY 2020, all new Federal buildings are to be designed to achieve zero-net energy by FY 2030.
- b. Comply with the, "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles)," in all new construction, major renovation or repair and alteration of Federal buildings.
- c. Assess and demonstrate that at least 15% of Agency's existing government-owned buildings, Agency direct-leased buildings, delegated authority leased buildings, and FRPP-reported leased buildings meet Guiding Principles by FY 2015 [5,000 GSF threshold for existing buildings and building leases].
- d. Demonstrate annual progress toward 100% conformance with Guiding Principles for entire building inventory by 2015 and thereafter.
- e. Incorporate sustainable practices into Agency policy and planning for new Federal facilities and leases, and into lease renewal strategies.
- f. Demonstrate use of cost-effective, innovative building and sustainable landscape strategies to minimize energy, water, and materials consumption and decrease fertilizer, herbicide, and pesticide application.
- g. Operate and maintain, and conduct all minor repairs and alterations for existing building systems to reduce energy, water and materials consumption in a manner that achieves a net reduction in Agency deferred maintenance costs.
- h. Optimize performance of the Agency's real property portfolio – dispose and consolidate excess and underutilized property, co-locate field offices, consolidate across metropolitan and regional locations.
- i. Reduce need for new building and field office space by utilizing technologies to increase telework opportunities and expand delivery of services (over the internet or electronically).
- j. Conserve, rehabilitate, and reuse historic Federal properties, using current best practices and technology.
- k. Align Agency space actions (new leases, new construction, consolidation) with Agency Scope 1&2 and Scope 3 GHG reduction targets.

Regional and Local Planning

- a. Incorporate timely consultation with local and metropolitan planning organizations regarding the impact, or potential impact, of Federal actions on local transportation infrastructure and local development plans into existing policy and guidance.
- b. Align Agency policies to increase effectiveness of local planning efforts regarding transportation, energy resources and the environment.
- c. Align Agency policies and actions to increase the effectiveness of regional measures that enhance integrity of local ecosystems and watersheds.
- d. Update Agency policy and guidance to ensure that all Environmental Impact Statements (EIS's) and Environmental Assessments (EA's) required under the National Environmental Policy Act (NEPA) for proposed new or modified Federal facilities identify and analyze impacts associated with energy (including alternative energy sources) and climate change, where appropriate and practicable.
- e. Integrate methods and practices necessary to achieve the goals of this plan into Agency master planning documents (i.e., high-performance, sustainable building goals, pollution prevention and waste reduction goals, water use reduction goals, sustainable acquisition goals, electronic stewardship and data center consolidation, etc.).
- f. Update Agency policy and guidance to ensure timely coordination and (where appropriate) consultation with Federal, State, Tribal and local management authorities regarding impacts to local ecosystems, watersheds and environmental management associated with proposed new or modified Federal facilities.

- g. Discuss Agency participation in critical local and regional efforts and initiatives (e.g., Executive Order on Chesapeake Bay Protection and Restoration, Executive Order on Stewardship of the Ocean, Our Coasts, and the Great Lakes).

2.3.2 Agency Lead for Goal

Agency Lead - High-Performance Sustainable Design / Green Buildings

Scott Robinson, Director, Facilities Engineering Division

Goal Manager - High-Performance Sustainable Design / Green Buildings

Eugene Mszar, CoF Program Manager, Facilities Engineering Division

Agency Lead - Regional and Local Planning

Frank Bellinger, Director, Technical Capabilities & Real Property Management Division

Agency Manager - Regional and Local Planning

Kim Toufectis, Master Planning Program Manager, Technical Capabilities & Real Property Management Division

2.3.3 Highlights

NASA received its first USGBC LEED® Platinum rating in 2010 for a 92,000 sf building constructed at the Johnson Space Center, Building 20. The facility is optimized for solar orientation and constructed with integral shading devices and high-efficiency glazing in order to minimize energy use and maximize day lighting. Solar water heating is used for the restrooms, and low-flow restroom fixtures limit water usage. The highly reflective roof is Energy Star compliant. The high-performance building is estimated to use 57.8% less energy when compared to a typical office building.

NASA expects to receive a LEED® Platinum rating shortly for a second building, the Propellants North Administration and Maintenance Facility at the Kennedy Space Flight Center. This project replaces three 40-year-old-plus structures, providing new space for maintenance shops, offices, equipment and material storage in support of cryogenic fuel transfer functions for KSC. This project includes an 80KW solar array, an electric vehicle solar powered charging canopy and installation of a drip irrigation system and native landscaping. The new 11,340 sf facility is striving to be NASA's first "net-zero" facility.

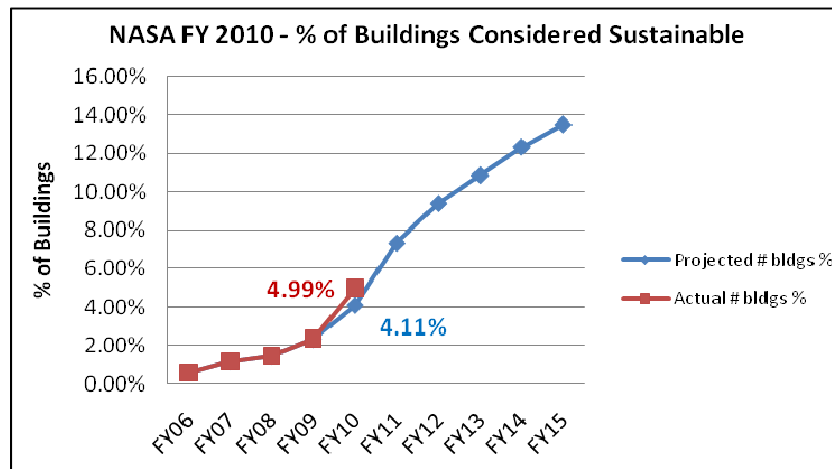
In Regional and Local Planning, each NASA Center updated its Master Plan during 2010 in accordance with NASA's recently-adopted Agency Facilities Strategy; sustainability is a central objective of that strategy. The central challenge facing the program is a lack of clarity about current and outyear Federal budgets, resulting in uncertainty as to whether resources will be available to implement an aggressive facilities renewal and consolidation program.

2.3.4 Agency Status

High-Performance Sustainable Design / Green Buildings

Figure 12 depicts NASA's progress toward achieving the FY 2015 federal requirement that 15% of an agency's buildings meet the Guiding Principles, which is measured in number of buildings. Currently, NASA is slightly above its established target of 4.11% (14 buildings) and achieved 4.99% (17 buildings). This represents 1,051,848 sf of NASA facilities meeting the Guiding Principles. This metric is updated as NASA buildings meet this requirement, is reviewed semi-annually by the Office of the Federal Environmental Executive (OFEE), and is incorporated in the NASA HQ EMS.

Figure 12. Percent of NASA Buildings Meeting Guiding Principles by FY 2015 Requirement



Several funding strategies are being examined to support the High-Performance Sustainable Design/Green Buildings goal. In addition to the CoF budget, other funds under consideration to support improving the sustainability of NASA facilities include:

- NASA's Strategic Investment Initiative, established to support the achievement of long-term strategic and mission support goals;
- Third party financing through ESPCs and UESCs; and
- Proceeds received through Enhanced Use Lease agreements.

Regional & Local Planning

- At NASA HQ, the Master Planning Program Management position was recently expanded from a part-time to a primary/full-time assignment to improve advocacy, guidance, oversight, and coordination of program requirements.
- NASA has expanded its Master Planning community of practice, increasing participation, training, and integration with program and institutional stewardship organizations at HQ and Centers.
- NASA is now using its Agency Facilities Strategy to better guide the development of specific facilities investments; it has planned an elevated funding level to enable a transition toward more sustainable facilities in better alignment with mission program requirements.
- NASA seeks to optimize the value of this increased investment stream by updating policies and procedures to integrate sustainability into Agency facilities stewardship from portfolio management to master planning to capital facilities development to facilities sustainment.
- NASA leadership works with external organizations to ensure that such policies are fiscally and environmentally sound and reflect the best practices for Federal facilities stewardship.

2.3.5 Positions

High-Performance Sustainable Design / Green Buildings

NASA civil servants generally have sustainable buildings as a part-time responsibility within a broad range of responsibilities. Some NASA Centers may have contractor support assigned part- or full-time on sustainability. Current staffing levels meet current requirements.

With the new requirements, NASA recognizes that current staffing needs better coordination and improved support from NASA HQ. NASA utilizes the OMFIT and the ECIC - consisting of approximately 40 representatives from NASA HQ and Center operations and maintenance, facilities design and construction, other organizations and support contractors - to ensure appropriate coverage of sustainable and high performance building requirements. The scope of the sustainability program includes:

- Employ integrated design principles
- Optimize energy performance
- Protect and conserve water
- Enhance indoor environmental quality
- Reduce environmental impact of materials

The NASA OMFIT and ECIC teams will provide an important role in developing NASA's Sustainable Facility management strategy, updating internal requirements, and providing the coordination and outreach necessary to achieve the goals of the EO.

Regional & Local Planning

NASA assigns key planning roles to civil servants at HQ and at each Center (where some perform this role as a part-time responsibility). NASA Centers supplement this workforce with contractor support in most cases. Staffing levels meet current requirements.

In committing to a greater degree of facilities planning integration across the Agency, NASA committed to better coordination and improved support from NASA HQ. NASA leverages a Master Planning community of practice consisting of approximately 50 institutional and program representatives from HQ and field installations to advance the quality and utility of master planning products. The scope of the master planning program includes:

- In place: Master planning is governed by policy developed at HQ and largely carried out at Centers. Plans were updated in 2010 for each Center in accordance with current requirements intended (among several objectives) to better address sustainability goals, including consolidation of Agency facility holdings and energy and water conservation planning.
- In progress: The Agency is currently integrating 2010 Center Master Plan updates into its first Agency Master Plan, in which sustainability is a central objective. The Agency is currently also revising Master Planning policy to more fully integrate sustainability and cultural resource stewardship practices. NASA is

also formalizing its master planning community of practice to more fully coordinate policy implementation Agency-wide. At least annually, Centers assess how well their plans fit evolving circumstances and requirements, performing studies as appropriate to understand and evaluate possible plan revisions.

2.3.6 Planning Table

SUSTAINABLE HIGH PERFORMANCE BUILDINGS (Buildings Meeting Guiding Principles)	Units	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Owned Buildings Target	%	7.33	9.38	10.85	12.32	13.49	-	-	-	-	-
FRPP-Reported Leased Buildings Target	%	0	0	0	0	0	-	-	-	-	-
Total Buildings Target	%	7.16	9.17	10.60	12.03	13.18	-	-	-	-	-
REGIONAL AND LOCAL PLANNING											
Other, as defined by agency	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

High-Performance Sustainable Design / Green Buildings

Since NASA established its policy in 2004 that all new construction or major renovation will be designed to sustainable standards, NASA has focused on replacing its largest, least efficient facilities with high performance buildings, or renovating those facilities to sustainable standards. This allowed NASA to achieve dramatic, measurable savings in utilities and maintenance costs. This strategy has placed a “cornerstone” sustainable facility at nearly every major NASA site. As NASA moves into a period of transition to a new human rated space architecture, there is some question about which current building assets will be retained and which will no longer be needed. In response to this uncertainty, NASA’s strategy is to continue investment that replaces or renovates major facilities that NASA will certainly need in the future and deferring investing in the many smaller facilities that NASA may not need in the future.

This strategy will result in more than 15% of the square footage of NASA’s building inventory meeting the guiding principles by 2015, but NASA expects that only 13.18% of NASA’s total number of buildings will meet the guiding principles. NASA intends to bring its existing building inventory to sustainable standards as it renovates and upgrades buildings identified for long term retention. NASA believes this is the most cost effective strategy to meet sustainability requirements, reduce operating costs as quickly as feasible and avoid unnecessary investment in facilities that may not be retained after NASA’s transition period.

2.3.7 Implementation Methods

High-Performance Sustainable Design / Green Buildings

NASA NPR 8820.2F, Facility Project Requirements, provides the minimum requirements for the planning and acquisition of NASA facility projects. In order to provide the most current methods for implementing the cost, schedule and performance for energy efficient and sustainable facilities, NPR 8820 is thoroughly reviewed and updated every five years. This policy:

- Provides Agency best practices to ensure that the most cost-effective and optimally-performing buildings are constructed and that energy and sustainable goals are met.
- Sets up a collaborative process for the Agency to formulate its CoF program.
- Provides guidance for facility project fiscal management.
- Sets up communication processes between NASA HQ and each Center for the purpose of reporting project status.

In order to communicate the most current federal legislation and policy related to sustainable facility design, updated goals and best practices to the Centers, FED provides regular sustainability training and workshops. NASA is currently updating its sustainable design training to reflect changes to USGBC LEED standards, incorporate the requirements of EO 13514, and to incorporate NASA’s own experiences in constructing and operating high performance buildings. The sustainable facility design and green building training will resume in the late summer of 2011. The training locations will rotate between Centers on a semi-annual schedule. FED-sponsored bi-annual workshops continue to highlight both intra- and interagency facility developments.

In addition to the 1.05 million sf of LEED® rated sustainable building space completed through 2010, NASA has their second LEED® Platinum designed facility in review with the USGBC reviewing body. The net-zero energy 11,340sf office and processing mixed-use facility incorporates an integrated 78kW photovoltaic system, a rainwater harvesting system, and a highly efficient HVAC system.



Propellants North Administration and Maintenance Facility at KSC

Two other major facilities will complete construction in 2011, the Collaborative Support Facility at ARC and New Town Building at LaRC. The Collaborative Support Facility has been designed to achieve LEED® Platinum rating. Other features within the facility include 100 geothermal wells, a photovoltaic system, a highly-efficient hydrogen fuel cell, and a real time environmental and thermal monitoring system.

The New Town Facility is a 74,000 sf building designed for LEED® Gold and replaces a comparable amount of area within inefficient and outdated facilities. The building features include a roof-mounted photovoltaic system, vegetative green roof, geothermal heat pump, and water reduction strategies for 40% less water usage.

Regional & Local Planning

- a. Complete NASA's first Agency Master Plan to provide a comprehensive framework for Agency infrastructure reduction and stewardship in support of Mission goals and objectives within available resource constraints. In support of Agency leadership, use the Agency Master Plan to:
 - Align facilities strategies with NASA's strategic facilities objectives: NASA will renew and modernize its facilities to sustain its capabilities, and to accommodate those capabilities in the most efficient facilities set practical;
 - Optimize current and planned funding with facilities strategies, mindful of other Agency and Federal requirements to maximize facilities performance in a sustainable fashion (safety, security, health, accessibility, economics, energy consumption, environmental stewardship, etc.).
- b. Complete the update of relevant Agency policies including NPR 8810.1, Master Planning for Real Property.
- c. Review Agency systems for auditing, tracking, and monitoring and implement improvements as appropriate.
- d. Verify that component Center Master Plans (presented to the Agency in graphic, tabular, and summary briefing forms) are updated to integrate sustainability concerns at all Agency installations, including:
 - Reducing the economic and environmental consequences of satisfying Agency program requirements within a smaller facilities asset portfolio (10% smaller by 2020 and 15% smaller by 2055, measured in real asset value).
 - Integrating into current plans (and setting 20-year targets) for energy, water, and GHG reductions.
- e. Support and update communication tools, including training, websites, and recognition programs such as the NASA Blue Marble Awards.
- f. Advocate for funding to achieve master plan benefits as a part of NASA's integrated Programming, Planning, Budgeting, and Execution (PPBE) System.
- g. Coordinate with other organizations as appropriate to ensure that the full range of relevant communities and issues are addressed, ranging from residential, commercial, and institutional neighbors, local, State, and regional government authorities, transportation and utilities system stewards, and relevant Federal oversight organizations.

2.3.8 Return on Investment

No significant projects or initiatives included in the previous year's SSPP have been deliberately cancelled or suspended due to a lower than expected ROI. Likewise, no specific projects or initiatives have been expanded due to higher than expected ROI.

2.4 GOAL 4 - WATER USE EFFICIENCY AND MANAGEMENT

2.4.1 Goal Description

- a. Reduce potable water use intensity by at least 26% by FY 2020.
- b. Reduce industrial, landscaping, and agricultural water use by at least 20% by FY 2020.
- c. Identify and implement water reuse strategies.

- d. Achieve objectives established by EPA in Stormwater Guidance for Federal Facilities.
- e. Incorporate appropriate reduction strategies for non-potable water use into Agency policy and planning.

2.4.2 Agency Lead for Goal

Agency Lead: James Leatherwood, Director, Environmental Management Division

Goal Manager: Michael Green, Environmental Engineer, Environmental Management Division

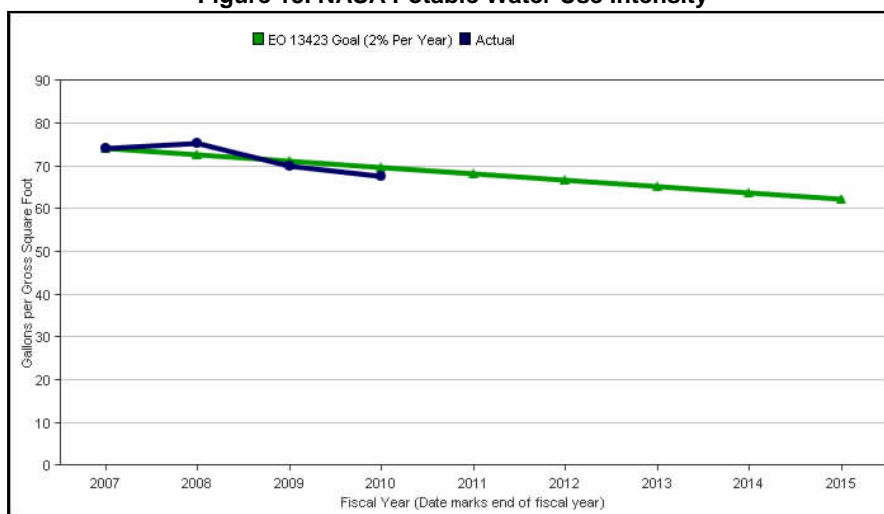
2.4.3 Highlights

Ames Research Center was recognized for implementing a water reuse project, winning the Federal Energy and Water Management – Water Conservation Small Group Award. Ames partnered with the City of Sunnyvale to pursue goals to reduce consumption of potable water and to reuse more water on site. The project included switching a significant amount of potable water usage to a reclaimed water system, creating a native plant garden restoration initiative, and instituting an aggressive water conservation educational outreach program. Reclaimed water is used for landscape irrigation, construction site dust control, and washing aircraft. The Native Plant Initiative converts high-maintenance, water-intensive turf/grass areas to low-maintenance, drought-tolerant native plants while reducing greenhouse gas emissions. The overall effort decreased ARC's potable water consumption by more than 80 million gallons and saved \$404,000 in FY 2009.

2.4.4 Agency Status

- a. NASA reported a potable water use intensity reduction of 9.8% from the baseline, thus, exceeding the target of 8% for FY 2011 (Figure 13).
- b. NASA established a NASA Water Program Community of Practice consisting of approximately 50 representatives from NASA HQ and Center environmental, facilities, other organizations, and support contractors, which meets bi-monthly to ensure appropriate coverage of water program requirements.
- c. NASA completed Environmental and Energy Functional Reviews at five NASA Centers and Component Facilities to evaluate conformance with water program requirements, goals and targets. Results were presented to Center management and summarized for the SSO during the annual EMS Management Review.
- d. In addition to the Ames project highlighted above, water conservation activities and projects were also implemented at the following Centers, estimated to total \$306,000 in annual savings and 127 million gallons in annual water savings:
 - Langley Research Center
 - Marshall Space Flight Center – Michoud Assembly Facility
 - Stennis Space Center

Figure 13. NASA Potable Water Use Intensity



2.4.5 Positions

NASA civil servants generally have water management as a part-time responsibility within a broad range of responsibilities. All NASA Centers also have contractor support and some have contractors assigned full time on water, particularly where water management represents a significant daily operational activity, such as where NASA provides its own water. Current staffing levels are meeting current requirements.

With the new EO requirements, NASA recognizes that current staffing needs better coordination and improved support from NASA HQ. NASA has established the NASA Water Program community of practice consisting of approximately 50 representatives from NASA HQ and Center environmental, facilities, other organizations and support contractors to ensure appropriate coverage of water program requirements. The scope of the water program includes:

- Water consumption/conservation – potable, industrial, and landscaping
- Drinking water
- Wastewater—Industrial and sanitary
- Storm water
- Wetlands
- Groundwater—on-site extraction for water consumption

The NASA Water Program community of practice will serve an important role in developing NASA's Water management strategy by assisting in the updating of internal policy documents (such as the upcoming Water NPR) and understanding any new guidance or requirements developed by the Interagency Work Group. This will help provide the coordination and outreach necessary to achieve the goals of the EO.

2.4.6 Planning Table

WATER USE EFFICIENCY AND MANAGEMENT	Units	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Potable Water Reduction Targets (gal/SF reduced from FY 2007 base year)	%	8	10	12	14	16	18	20	22	24	26
Planned Potable Water Reduction (gal/SF reduced from FY 2007 base year)	%	8	10	12	14	16	18	20	22	24	26
Industrial, Landscaping, and Agricultural Water Reduction Targets (gal reduced from FY 2010 base year)	%	2	4	6	8	10	12	14	16	18	20
Planned Industrial, Landscaping, and Agricultural Water Reduction (gal reduced from FY 2010 base year)	%	2	4	6	8	10	12	14	16	18	20

2.4.7 Implementation Methods

- a. Develop Water Resources NPR for a comprehensive NASA water program that includes drinking water, water conservation, water reuse, water quality, wetlands, and stormwater management. Anticipated completion date March 31, 2012.
- b. Review Agency systems for auditing, tracking, and monitoring water use and implement improvements as appropriate. Anticipated completion date March 31, 2012.
- c. Verify during triennial Environmental and Energy Functional Reviews at each Center that the Center's EMS evaluates water program requirements, goals and targets and that the results are reviewed by Center management. Anticipated completion date December 31, 2012.
- d. Support and update communication tools, including training, websites, and recognition programs such as the NASA Blue Marble Awards.
- e. Support Center efforts to implement water conservation practices through funding advocacy, audits, and assessments.
- f. Coordinate with other NASA organizations as appropriate to ensure water conservation measures, water reuse, and stormwater management are addressed, e.g., the Facilities Divisions with respect to high-performance buildings.

2.4.8 Return on Investment

No significant projects or initiatives included in the previous year's SSPP have been deliberately cancelled or suspended due to a lower than expected ROI. Likewise, no specific projects or initiatives have been expanded due to higher than expected ROI.

2.5 GOAL 5 - POLLUTION PREVENTION AND WASTE REDUCTION

2.5.1 Goal Description

- a. Increase source reduction of pollutants and waste.
- b. Divert at least 50% non-hazardous solid waste by FY 2015, excluding C&D debris.
- c. Reduce municipal solid waste sent to landfills to assist the Agency in achieving FY 2020 GHG reduction targets [See Goals 1 and 2 above] and discuss Agency strategies and implementation.
- d. Divert at least 50% C&D materials and debris by FY 2015, and discuss methods used to monitor and track progress.

- e. Reduce printing paper use.
- f. Increase use of uncoated printing and writing paper containing at least 30% postconsumer fiber.
- g. Reduce and minimize the acquisition, use, and disposal of hazardous chemicals and materials, and discuss how implementation will assist the Agency in achieving FY 2020 GHG reduction targets [See Goals 1 and 2 above].
- h. Increase diversion of compostable and organic materials from the waste stream.
- i. Implement integrated pest management and landscape management practices to reduce and eliminate the use of toxic and hazardous chemicals and materials.
- j. Increase Agency use of acceptable alternative chemicals and processes.
- k. Report in accordance with Sections (301-313) of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986.

2.5.2 Agency Lead for Goal

Agency Lead: James Leatherwood, Director, Environmental Management Division

Goal Manager: Paul Rob  rt, Environmental Engineer, Environmental Management Division

2.5.3 Highlights

NASA achieved multiple goals in 2010; most notably exceeding the 2015 goal of 50% for C&D solid waste diversion, by diverting 75% in FY 2010. NASA also met its previously established 2010 goal of 35% diversion in non-hazardous solid waste by diverting at least 36%, putting it on a path to meet the new FY 2015 diversion goal of 50%. The Agency continued operation of the Recycling and Sustainable Acquisition (RSA) Principal Center, expanded the RSA Community of Practice (CoP), established a new IT forum to support the RSA CoP in exchanging information, lessons learned and collaboration, and established an Agency-wide Green the Cafeteria workgroup.

2.5.4 Agency Status

A large part of NASA's success was the result of individual Center activities and initiatives as well as those of the RSA Principal Center. The RSA, HQ staff and Center personnel worked as a team to accomplish many of the goals set forth in the SSPP. The RSA team conducted three Center site visits in FY10, completing reviews of the Agency's Centers and facilities with respect to pollution prevention and waste reduction. The purpose of these site visits was to facilitate and assist in greater alignment to Agency goals by sharing information and providing training and assistance to the recycling and sustainable acquisition communities. Because communication is a key element to the success of the Agency's RSA program, the team utilizes various methods to connect with the RSA community. One component, introduced in 2010, was the creation and rollout of a new IT forum, the RSA SharePoint site. This allows the RSA community to have greater flexibility in sharing information while maintaining an internal document library. The RSA team also hosted four video conferences for the RSA community across the Agency, including live presentations from the House of Representatives, Sandia National Laboratory, and General Services Administration. The RSA team has also provided leadership for the Green the Cafeteria Agency workgroup formed in 2010 to further efforts in buying environmentally preferable dining products.

A continuing challenge for the Agency is to keep up with changing requirements, support-required reports and the continued reduction of Agency institutional operating funds which greatly impacts the Center's abilities to meet many of the goals of the SSPP. Another challenge has been to increase knowledge and commitment in non-environmental communities and to break old habits, while maintaining a "green" momentum. An opportunity for improvement has been to integrate the activities of the procurement and environmental communities for the advancement of the Agency sustainable acquisition program.

The Agency has:

- a. Increased source reduction of pollutants and waste.
- b. Diverted at least 36% non-hazardous solid waste in 2010, excluding C&D debris. This met the Agency's previous goal of 35% reduction by FY 2010 and places the Agency on track to meet the 50% reduction goal by FY 2015.
- c. Reduced municipal solid waste sent to landfills through implementing Center level recycling programs reducing both the amounts sent to landfills as well as reducing the volume of waste by compacting. The reduction in volume reduced the number of vehicle trips. These actions not only help meet requirements of the solid waste program but aid the Agency in reducing GHG's [See Goals 1 and 2 above].
- d. Diverted 75% C&D materials and debris in FY 2010 exceeding the 50% goal by FY 2015.
- e. Reduced printing paper use.
- f. Increased use of uncoated printing and writing paper containing at least 30% postconsumer fiber.

- g. Reduced and minimized the acquisition, use, and disposal of hazardous chemicals and materials; implementation will assist the Agency in achieving FY 2020 GHG reduction targets [See Goals 1 and 2 above].
- h. Diverted 2,165 tons of compostable and organic materials from the waste stream.
- i. Continued to implement integrated pest management and landscape management practices at NASA centers to reduce and eliminate the use of toxic and hazardous chemicals and materials.
- j. Increased Agency use of acceptable alternative chemicals and processes.
- k. NASA continued to meet its reporting and planning obligations in accordance with Sections (301-313) of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986.

2.5.5 Positions

NASA supports its RSA Principal Center with two full time contract support personnel. NASA civil servants generally have pollution prevention and waste reduction as a part-time responsibility within a broad range of responsibilities. NASA Centers also employ contractors to help execute their pollution prevention and waste reduction programs. Current staffing levels are minimally sufficient to meet current requirements.

NASA has established the RSA CoP consisting of approximately 130 representatives from NASA HQ and Center environmental, procurement, facilities, other organizations, and support contractors to ensure appropriate coverage of program requirements, exchange ideas and obtain feedback on what is working and what is not.

The NASA RSA CoP will continue to provide an important role in developing NASA's pollution prevention and waste reduction management strategy, updating internal requirements, and providing the coordination and outreach necessary to achieve the goals of the SSPP.

2.5.6 Planning Table

POLLUTION PREVENTION AND WASTE REDUCTION	Units	FY10 Actual	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Non-Hazardous Solid Waste Diversion Targets (Non-C&D)	%	36%	38%	41%	44%	47%	50%	-	-	-	-	-
C&D Material & Debris Diversion Targets	%	75%	38%	41%	44%	47%	50%	-	-	-	-	-
If Agency uses on-site or off-site waste-to-energy, estimated total weight of materials managed through waste-to-energy	Tons	3,056	-	-	-	-	-	-	-	-	-	-
Number of sites or facilities on-site composting programs	#	4	-	-	-	-	-	-	-	-	-	-
Number of sites or facilities recycling through off-site composting programs	#	3	-	-	-	-	-	-	-	-	-	-
If Agency has on-site or off-site composting programs, estimated total weight of materials diverted to composting	Tons	2,165	-	-	-	-	-	-	-	-	-	-
% of Agency-operated offices/sites with a recycling program	%	100	-	-	-	-	-	-	-	-	-	-
If Agency offices located in multi-tenant buildings, % of those buildings with a recycling program	%	92	-	-	-	-	-	-	-	-	-	-
% of Agency-operated residential housing with recycling programs	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

*Diversion refers to source reduction and recycling and does not include waste-to-energy.

2.5.7 Implementation Methods

NASA has implemented ambitious pollution prevention and waste diversion initiatives since the early 1990s, and continually re-evaluates and refines its processes to further eliminate the use of hazardous materials and the generation of waste. The current process involves pollution prevention and waste diversion initiatives that enable environmentally sound mission success, so NASA can continue to restore, protect, and enhance its mission resources. Initiatives such as waste diversion and the purchase of recycled-content, biobased content and other environmentally preferable products benefit the environment and demonstrate our commitment to environmental stewardship. The following points illustrate how NASA will achieve its goals for FY11 and beyond:

- Continue NASA's RSA Principal Center, which was established to provide resources and support to help NASA excel within the federal government in waste prevention, recycling, and sustainable acquisition by achieving the waste diversion goal of 50% by the year 2015 and maintaining compliance in sustainable acquisition.
- Continue to utilize the Agency's and Centers' EMS to help obtain established goals.

- Continue to utilize the Agency's Environmental Functional Review (EFR) process to assess the effectiveness of Center systems and processes established to meet the goals.
- Improve the effectiveness of training (contract specifications, purchasing and purchase cards) programs to support the goals.
- Revise NPR 8530.1A, Affirmative Procurement Program and Plan for Environmentally Preferable Products, to better support the Agency's processes and procedures to meet the goals.

More specifics on the Agency's implementation methods can be found in the Agency's NPR 8530.1A and the "2010 Sustainable Acquisition, Practices: Green Purchasing, Waste Management, and Chemicals Management Report."

2.5.8 Return on Investment

No significant projects or initiatives included in the previous year's SSPP have been deliberately cancelled or suspended due to a lower than expected ROI. Likewise, no specific projects or initiatives have been expanded due to higher than expected ROI.

2.6 GOAL 6 - SUSTAINABLE ACQUISITION

2.6.1 Goal Description

- Ensure 95% of new contract actions, including task and delivery orders under new contracts and existing contracts, require the supply or use of products and services that are energy efficient (Energy Star or FEMP-designated), water efficient, biobased, environmentally preferable (excluding Electronic Product Environmental Assessment (EPEAT)-registered products), non-ozone depleting, contain recycled content, or are non-toxic or less toxic alternatives.
- Update Agency affirmative procurement plans (also known as green purchasing plans or environmentally preferable purchasing plans), policies and programs to ensure that all mandated Federally designated products and services are included in all relevant acquisitions.

2.6.2 Agency Lead for Goal

Agency Lead: Bill McNally, Director, Assistant Administrator, Office of Procurement

Goal Managers: Marilyn Chambers, Procurement Analyst, Office of Procurement

Paul Rob  rt, Environmental Engineer, Environmental Management Division

2.6.3 Highlights

NASA's highly dedicated environmental and procurement staffs continue to pursue every avenue for advancing sustainable acquisition. Both HQ and Center staff have maximized opportunities to communicate and exchange information, ideas, and assistance. NASA's main challenges are competing workload demands, finding an automated method for tracking its sustainable acquisition performance, and engaging program, project, and requirements initiators in building sustainable acquisition elements during the acquisition planning phase. A continuing challenge has been to increase knowledge and commitment in non-environmental communities and to break old habits, while maintaining a "green" momentum. An opportunity for improvement has been to integrate the activities of the procurement and environmental communities for the advancement of the Agency sustainable acquisition program.

2.6.4 Agency Status

NASA achieved multiple goals in 2010. A large part of NASA's success was the result of expanding its communication and collaboration between and amongst NASA communities. This was through individual Center activities, the environmental, procurement, and program community initiatives as well as those of the Principal Center for Recycling and Sustainable Acquisition (RSA).

The RSA, HQ, and Center personnel worked as a team to accomplish many of the goals set forth in the 2010 SSPP. The RSA team conducted three Center site visits in FY10, completing reviews of the Agency's Centers and facilities. The purpose of these site visits is to facilitate and assist in greater alignment to Agency goals by means of sharing information and providing training and assistance to the recycling and sustainable acquisition communities. Because communication is a key element to the success of the Agency's program, the team utilizes various methods to connect with the RSA community. To encourage ongoing dialog, RSA developed and maintains a comprehensive interactive website. The site provides a vast array of sustainable acquisition information, a document library, and links to other useful sites. The website also permits instant information sharing.

The RSA team also hosted four video conferences for the RSA community across the Agency, including live presentations from the House of Representatives, Sandia National Laboratory, and General Services Administration on methods to increase sustainable acquisition. One session included purchase card coordinators from each Center so that both communities could become aware of opportunities to collaborate. The RSA team has also provided

leadership for the Green the Cafeteria Agency workgroup formed in 2010 to further efforts in buying environmentally preferable dining products.

HQ and Center environmental and procurement representatives formed a "Goal 6 Workgroup." With RSA's facilitation, the workgroup conducted a series of teleconferences to examine current NASA policies and procedures to find ways to advance sustainable acquisition. The group is currently collaborating on a rewrite of NASA's Affirmative Procurement Program to expand it to cover all aspects of sustainable acquisition and address acquisition planning, implementation, data collection, oversight, and continuous improvement.

NASA's Academy of Program/Project and Engineering Leadership (APPEL) sponsored one of their "Master with Masters" sessions on Sustainability in Government. Participants included Olga Dominguez, NASA's SSO, Michelle Moore, Federal Environmental Executive, White House Council on Environmental Quality, and Dr. Brian Nattrass, co-founder and managing partner of Sustainability Partners, Inc. This session was conducted at NASA's HQ auditorium and brought sustainable acquisition topics to the entire NASA community. APPEL also designed a new course for their program/project management curriculum entitled, "Introduction to Green Engineering." This course was designed to involve NASA practitioners in a Forum where they could hear from leaders in various segments of industry, academia, and other government and international concerns who have been involved in sustainable acquisition, and exchange ideas about how sustainable practices might be addressed within NASA. The course includes environmentally conscious design, materials selection, and manufacturing techniques. The vast majority of current NASA contracts are for engineering and technical or research and development services where we are not buying products. By introducing the engineering and program/project community to sustainable acquisition, we will educate the professionals involved in acquisition planning and initiating requirements to include sustainability in every acquisition.

To improve outreach and education NASA has presented numerous courses to employees on sustainable acquisition. Our acquisition professional training includes sustainable acquisition in the curriculum required for certification. NASA offered the Defense Logistic Agency's Buying Green Course at the annual RSA Workshop in 2010. A June offering of the course will be provided for procurement staff from each NASA center. A half day of this course will be an interactive session including NASA's environmental subject matter experts discussing key components of NASA sustainability plan and its implementation. NASA updated training for purchase cardholders and their approving officials to cover all aspects of sustainable acquisition, how to screen for environmental preferences, and where to find sustainable products.

A major challenge is tracking the sustainable areas in NASA's contract actions. The Federal Procurement Data System (FPDS) does not provide useful data for tracking Goal 6 and no plans are in place for updating the system. NASA contributed comments to a recent action to include more environmentally descriptive product service codes to be used in FPDS; however, additional codes will not resolve the tracking problem since the preponderance of NASA's contracts are for services, not the direct purchase of supplies, such as recycled or biobased products. NASA is working with its Agency-wide contract writing system vendor to add a configurable field in the system which will allow contracting officers to report when contract actions include for sustainable items. The proposed change will allow the contracting officer to input whether a particular contract action includes products which are biobased, energy-efficient, recycled or recovered material content, water efficient, environmentally preferable, or have multiple attributes. When operational, NASA expects this data collection to allow it to automate its currently manual tracking process and allow us to generate reports based on the data input.

To maximize the benefit of the federal strategic sourcing initiative, NASA is encouraging the procurement community to use GSA's office supplies strategic sourcing effort, labeled OS2, which also allows us to track environmentally preferable products.

The Office of Procurement at HQ conducts Procurement Management Reviews (PMR) of each Center every three years. This review includes reviewing performance on sustainable acquisition. Four PMRs were conducted in FY2010. No sustainable acquisition issues were raised or weaknesses found. Also, each Center conducts a self-assessment every 6 months or generally twice a year. Again, no findings were reported.

- a. The Agency has already made excellent progress over the past years in getting requirements into the appropriate contracts. For the 1st quarter of FY 2011 the Agency's review of applicable contracts showed that 97% of contract actions met the sustainable acquisition requirement, thereby exceeding the goal of 95%. NASA will continue to ensure that new contract actions, including task and delivery orders under new contracts and existing contracts, require the supply or use of products and services that are energy efficient (Energy Star or FEMP-designated), water efficient, biobased, environmentally preferable (excluding EPEAT-

registered products), non-ozone depleting, contain recycled content, or are non-toxic or less toxic alternatives.

- b. NPR 8530.1A was last updated April 2009 to include bio-based requirements. The Agency is in the process of completing the re-write of NPR 8530.1A "Affirmative Procurement Program and Plan for Environmentally Preferable Products" by the end of calendar year 2011. The re-write is anticipated to improve NPR implementation at all levels, ensure proper coordination, assign responsibilities, and ensure that all Federally-mandated designated products and services are included in all relevant acquisitions.

2.6.5 Positions

NASA's RSA Principal Center supports a portion of sustainable acquisition implementation with two full time contractor personnel. The RSA provides a dedicated sustainable acquisition web site, information sharing, and training for the NASA workforce. Development and implementation of Goal 6 policy, procedures, and reporting is carried out by HQ and center procurement personnel as a collateral duty. Supporting this goal, particularly in terms of reporting, is labor intensive owing to the fact that it cannot be completed electronically and requires acquisition professionals to spend time reviewing files and collecting information on individual contract actions. Resources are severely stretched in the procurement community, requiring personnel to juggle their operations duties with data calls and participation in policy making. As noted in Section 2.6.4, NASA is working with its Agency wide contract writing system vendor to add a configurable field in the system which will allow contracting officers to report when contract actions include for sustainable items.

NASA established the Procurement Community of Practice in October 2009 consisting of representatives from NASA HQ and Center personnel to ensure appropriate coverage of sustainable acquisition requirements.

2.6.6 Planning Table

SUSTAINABLE ACQUISITION	Units	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
New Contract Actions Meeting Sustainable Acquisition Requirements	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold
Energy Efficient Products (Energy Star, FEMP-designated, and low standby power devices)	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold
Water Efficient Products	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold
Biobased Products	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold
Recycled Content Products	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold
Environmentally Preferable Products/Services (excluding EPEAT – EPEAT is included in Goal 7))	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold
SNAP/non-ozone depleting substances	%	95%	hold	hold	hold	hold	hold	hold	hold	hold	hold

SUSTAINABLE ACQUISITION CONTRACT REVIEW	1 st QTR FY 11	2 nd QTR FY 11	3 rd QTR FY 11 (Planned)	4 th QTR FY 11 (Planned)
Total # Agency Contracts	668	2,279	2,684	3,006
Total # Contracts Eligible for Review	64	336	625	743
Total # of Contracts Reviewed	64	228	TBD	TBD
Total % Eligible Contracts Reviewed (i.e., 5% or more eligible based on previous OMB guidance)*	100%	67.9%	TBD	TBD
# of Compliant Contracts	63	139	TBD	TBD
Total % of Compliant Contracts	98.4%	61%	TBD	TBD

To collect the NASA required information for the OMB Scorecard and SSPP submissions, the NASA Office of Procurement created a report of all NASA contract actions, (100%), including purchase orders, delivery orders, task orders, and contracts for the first quarter of FY11, based on FPDS data. The data was divided up by NASA Center. Procurement personnel at each center were directed to review each action and determine if the action could have included sustainable acquisition products, in the areas listed below, either procured directly, delivered under the contract, or where the contractor was using the item in performance of the contract.

Sustainable Products:

- CPG/Recycled Content
- Biobased/Biopreferred
- Energy Star/FEMP
- Environmentally Preferable (includes SNAP, nontoxic and less toxic alternatives)

If not already familiar with these products, personnel must research each area and become familiar with the products required in the various programs, e.g., biobased or FEMP. Staff were briefed on the process and given the guidance that these products are generally associated with construction, operation and maintenance, information technology, and on-site contracts. These and any other eligible contracts should be reviewed to ensure they included environmental clauses or specifications. A spreadsheet was provided to collect which contracts were reviewed and which sustainable attributes the contracts contained. Each Center's report was consolidated at HQ into the scorecard/SSPP template.

2.6.7 Implementation Methods

The Federal Acquisition Regulation (FAR), Part 23 addresses policy at the Federal government level¹². The NASA FAR Supplement, Part 23, addresses NASA's implementation of the FAR requirements¹³. NASA also has a Procurement Information Circular (PIC) 01-27 to address the "Applicability of Affirmative Procurement"¹⁴. Additionally, NASA PIC 08-04, "Environmental Reporting," addresses reporting requirements¹⁵.

NPR 8530.1A also provides NASA policy on implementing this goal. NASA relies primarily upon these documents to establish direction and guidance on proper procurement language in its contracts. In response to the specific requirements of EO 13514:

- NASA plans, once FAR cases 2010-001 and 2010-004 are finalized, to make changes to NASA procurement policy to implement these requirements. (FAR Case 2010-001 is to incorporate EO 13514 acquisition requirements. FAR case 2010-004 incorporates biobased procurement requirements.)
- Proposed changes to NASA procurement policy will be made in collaboration with the NASA Goal 6 Workgroup and through the regulatory process.
- Improve communication and training among all parties involved in sustainable acquisition: program, procurement, facilities and environmental.

2.6.8 Return on Investment

We have not initiated any return on investment (ROI) projects in the area of sustainable acquisition.

2.7 GOAL 7 - ELECTRONIC STEWARDSHIP AND DATA CENTERS**2.7.1 Goal Description**

- Ensure acquisition of EPEAT registered, Energy Star qualified, and FEMP designated electronic office products when procuring electronics in eligible product categories.
- Establish and implement policy and guidance to ensure use of power management, duplex printing, and other energy efficient or environmentally preferred options and features on all eligible Agency electronic products.
- Update Agency policy to reflect environmentally sound practices for disposition of all Agency excess or surplus electronic products.
- Discuss how the Agency will increase the quantity of electronic assets disposed through sound disposition practices. Include in the discussion how your Agency is using or plans to use programs such as disposal through GSA Xcess, recycling through Unicor, donation through GSA's Computer for Learning (CFL) or other non-profit organizations, and/or recycling through a private recycler certified under the Responsible Recyclers (R2) guidance or equivalent certification.
- Discuss how the Agency will require IT planning/Life Cycle Manager to replace and or waive equipment that does not meet "Green" compliance requirements.
- Update Agency policy to ensure implementation of best management practices for energy efficient management of servers and Federal data centers, including how the Agency will meet data center reduction goals included in the Federal Data Center Consolidation Initiative.

2.7.2 Agency Lead for Goal

Agency Lead: Linda Y. Cureton, Chief Information Officer,

Goal Manager: Jackie Gill, Associate Deputy, Office of the Chief Information Officer/Enterprise Services & Integration

¹² <https://www.acquisition.gov/far/current/html/FARTOCP23.html#wp227606>

¹³ <http://www.hq.nasa.gov/office/procurement/regs/1823.htm>.

¹⁴ <http://www.hq.nasa.gov/office/procurement/regs/pic01-27.html>

¹⁵ <http://www.hq.nasa.gov/office/procurement/regs/pic08-04.html>

2.7.3 Highlights

NASA completed a walkthrough of all 79 data centers and performed a power monitoring assessment. For each data center, a list was provided of metering devices required to measure Power Utilization Effectiveness (PUE) and a map of the power tree that indicates where each of the metering devices should be placed. All NASA centers are in various stages of implementing metering; meter installation is complete at one center and a baseline PUE has been calculated for that data center. Additionally, NASA deployed the IT Asset Discovery and Application Mapping tool at six NASA centers and will complete the tool deployment in FY11 Q4. The NASA centers where the tool is deployed are conducting additional discovery tasks and mapping both custom and commercial applications.

2.7.4 Agency Status

- a. NASA's Outsourcing Desktop Initiative for NASA (ODIN) contract leases the majority of desktops, laptops, and other electronic assets and has been updated to procure only energy star and EPEAT-Gold compliant electronic assets. The majority of electronic assets are procured through the ODIN contract but some Centers directly procure the electronic assets. Also, the ODIN contract strongly encourages that all end of life computers are disposed of through donation processes. While the contractor owns most of the computers in question, and is free to dispose of them as they would other private property, NASA provided contract language to promote the use of Computers for Learning (CFL) and similar programs. NASA updated the policy and guidance to provide information to CFL recipients on proper final disposition. The ODIN contract, under Information Technology Infrastructure Integration Program (I3P), has been rebid and awarded in the Agency Consolidated End User Services (ACES) contract. This contract includes language requiring energy savings including energy saving equipment and its final disposition (contract starts in the 1st Quarter of FY 2012). It is expected that more of the non-ODIN equipment will migrate to the ACES contract and hence meet the Energy Star and EPEAT standard.
- b. NASA provided guidance to its employees in 2007 for leveraging proper management options to reduce energy usage. NASA implemented these power options in the core image that is installed on the electronic devices managed by the ODIN contract, which covers just under 70% of the NASA desktops. NASA also issued guidance to its employees in 2007 to promote duplex printing. The current standard is being reviewed to increase use of duplex printing.
- c. All electronic assets procured/leased through the ODIN contract are EPEAT-Gold compliant. NASA has incorporated the Master Hardware Specification (NASA-STD-2805) to include EPEAT language in all IT procurement contracts since 2007 and in the new Agency Consolidated End User Services (ACES) contract. NASA modified NPR 8530.1 to include EO 13423 and EO 13514 EPEAT requirements. The table under section 2.7.6, Electronic Stewardship & Data Centers, reflects the ODIN and soon to be ACES projections.
- d. Data center architecture is now being referred to as Host computing. A host computing architecture vision has been developed as well as a charter and reference architecture. A lead architect has been assigned and is holding bi-weekly meetings to develop and update the architecture. This architecture is being integrated with the other portions of the enterprise architecture. The initial draft has been reviewed and is currently in revision.
- e. An Agency Data Center Consolidation team completed a manual inventory of assets based on property records, overlaid on GIS drawings. This helped identify all locations at each NASA center that contained server assets, essentially identifying the Agency's "server rooms". This data was subsequently vetted and corrected by Center staff and is being used to identify targets of consolidation and enhance reporting to OMB until the automated inventory tool deployment can be completed.
- f. NASA purchased an IT Asset Discovery and Application Mapping tool to compile a living inventory of data center assets and utilization. This tool will ultimately help identify underutilized hardware that could be the subject of data center consolidation or virtualization. NASA has deployed the IT Asset Discovery and Application Mapping tool at six NASA centers and will complete the tool deployment in FY11 Q4. The NASA centers where the tool has been deployed are working to do additional discovery and working on the mapping of both custom and commercial applications.
- g. NASA completed a walkthrough of all 79 data centers and performed a power monitoring assessment. For each data center, a list has been provided of metering devices required to measure PUE and a map of the power tree indicating where each of the metering devices should be placed. All NASA centers are in various stages of implementing metering; meter installation has been completed at one center and we have calculated a baseline PUE for that data center.
- h. NASA has reduced the total number of data centers from the original 79 reported down to 54. Our revised commitment to OMB indicates that we will reduce to approximately 25 data centers by 2015. NASA has not met some of the data center related metrics. Descriptions of some of the issues follow:

- Currently only one data center is metered and NASA is working towards a 2015 target of having 25 data centers metered. Progress is slowed by budget shortfalls, complicated negotiations with facility providers, and the need to schedule installation of meters coincident with planned outages. Without appropriate funding for the meters and installation, the mandate cannot be met.
- NASA currently has 54 data centers and the 2015 goal is 25. Planning is not yet completed to project the numbers in 2012-2014 but should be completed by the end of FY11.
- There is currently no comprehensive way to measure CPU utilization; however, NASA is deploying an inventory tool to do this, and won't be able to measure performance until the deployment is complete (Quarter 1, FY 2012). The Federal Data Center Consolidation Initiative (FDCCI) is in the process of streamlining the data reporting requirements and is considering elimination of utilization metrics that are difficult to measure and may not be meaningful when used on a large scale. NASA looks forward to future SSPP table templates for this goal which may reflect the FDCCI's efforts.
- Since all of the data centers are not metered and without funding to purchase and install meters, average Agency PUE cannot be calculated.

2.7.5 Positions

The Agency has assigned a dedicated data center consolidation team which is working the initial inventory and analysis activities, and will add representation from all Centers as the plans mature.

Every Center has a staff of personnel (some government, some contractor) tasked to manage property, and specifically the disposal of property. These personnel would execute any property disposal improvements identified for electronic assets as part of their standard duties.

Every Center has a staff of personnel (mostly contractor) who are tasked to manage IT-based electronic assets. These "systems administrators" would implement any configuration policy decisions made relating to improving energy efficiency and environmental friendliness as part of their standard duties.

2.7.6 Planning Table

ELECTRONIC STEWARDHIP & DATA CENTERS	Unit	FY10	FY11	FY12	FY13	FY14	FY15
% of electronic product acquisitions covered by current Energy Star specifications that must be energy-star qualified	%		100%	100%	hold	hold	hold
% of covered electronic product acquisitions that are EPEAT- registered	%		95%	95%	hold	hold	hold
% of covered electronic product acquisitions that are FEMP- designated	%		95%	95%	hold	hold	hold
% of Agency, eligible PC, Laptops, and Monitors with power management actively implemented and in use (one caveat is that NASA PCs are left on in a lower power mode for backups over night)	%		100%	100%	100%	hold	hold
% of Agency, eligible electronic printing products with duplexing features in use	%		95%	100%	100%	hold	hold
% of electronic assets covered by sound disposition practices	%		100%	100%	100%	hold	hold
% of Agency data centers independently metered, advanced metered, or sub-metered to determine monthly (or more frequently) Power Utilization Effectiveness (PUE)	%	0	40%	60%	80%	90%	100%
Reduction in the number of Agency data centers	#	79	54	?	?	?	25
% of Agency data centers operating with an average CPU utilization greater than 65%	%	TBD	50%	75%	hold	hold	hold
Maximum annual weighted average Power Utilization Effectiveness (PUE) for Agency.	#	TBD	1.8	1.7	1.6	1.5	1.4

2.7.7 Implementation Methods

- Review Agency policy and practice regarding leveraging energy efficient and/or environmentally preferred options and features of electronic products. Update policy and practice where necessary to ensure that these features are leveraged wherever possible and practical.

- b. Review Agency policy and practice regarding disposition of excess and surplus electronic products. Update policy and practice where necessary to ensure sound disposition methods are employed.
- c. Review Agency policy and practice regarding energy efficient management of servers and data centers. Update policies and practices where necessary to ensure that these practices are leveraged wherever possible and practical.
- d. Continue the OMB Data Center Consolidation Initiative to reduce the number of data centers, increase the use of cloud computing, and improve the energy efficiency of the remaining data centers.
 - Finalize the 2015 “To Be” portfolio of data centers
 - Based on the Enterprise Architect's assessment, develop a list of applications/systems that can be eliminated, consolidated, virtualized, or can be served by using cloud computing.
 - Develop a strategic plan through 2015 that allows us to define how to get to the “To Be” state
 - Continue to identify applications and projects that are candidates for both private and commercial cloud computing
 - Continue to meter the remaining data centers so that we can capture PUE. Implement energy savings measured in data centers once the PUE is baselined.
 - Complete the deployment of the inventory tool, continue to refine that data and apply that data to consolidation opportunities
 - Utilize the data from manual inventory mapping to identify server rooms for consolidation and complete those consolidations.
- e. Continue to explore the possibility of using the Department of Energy's Energy Savings Performance Contracts to guide a data center renovation and consolidation and engage the procurement process on at least one such project.
- f. NASA's Office of the Chief Information Officer (OCIO) is partnering with the property division to determine and ensure all excess and surplus electronic assets are disposed through sound disposition practices. The contracts under I3P include energy savings requirements, including energy saving equipment and its sound disposition. It is expected that more of NASA's desktops will fall under I3P each fiscal year from the just under 70% in the current ODIN contract.
- g. Two recent statutes, EPAAct 2005 and EISA 2007, modified the NECPA to require electricity metering at the federal building level by the end of FY 2012; the law requires using advanced metering to the maximum extent practicable to provide at least hourly data on at least a daily basis into energy tracking systems available to facility managers. NASA plans to meter all appropriate buildings within all Centers. This effort will continue through 2012. NASA will evaluate and prioritize the metering of data centers within this larger effort.

2.7.8 Return on Investment

No significant projects or initiatives included in the previous year's SSPP have been deliberately cancelled or suspended due to a lower than expected ROI. Likewise, no specific projects or initiatives have been expanded due to higher than expected ROI.

2.8 GOAL 8 - AGENCY INNOVATION & GOVERNMENT-WIDE SUPPORT

2.8.1 Goal Description

Support innovation in NASA Programs and Institutions to protect and enhance human health and the environment, and share innovations, best practices, and lessons learned with other Federal agencies and international partners.

2.8.2 Agency Lead for Goal

Agency Lead: Olga Dominguez, Assistant Administrator, Office of Strategic Infrastructure
NASA Senior Sustainability Officer

Goal Manager: James Wright, Deputy Assistant Administrator, Office of Strategic Infrastructure
Chair – HQ Sustainability Working Group

2.8.3 Highlights

This section includes some of the innovative practices and initiatives that support not only NASA's sustainability efforts but aid other agencies and organizations, both domestic and international.

As noted in Section 1.3, NASA shared its internal GHG inventory tool with the entire Federal family to support the initial interagency efforts to estimate and track GHG emission levels.

NASA and USAID signed a five-year memorandum of understanding on April 25, 2011. The agreement formalizes ongoing Agency collaborations that use Earth science data to address developmental challenges, and to assist in

disaster mitigation and humanitarian responses. NASA's SERVIR program integrates satellite observations, ground-based data and forecast models to monitor and forecast environmental changes and improve response to natural disasters in Central America, the Caribbean, Africa, and the Himalayas. It helps inform science-based decision-making in the areas of climate change, health, agriculture environment, water and weather. Marshall Space Flight Center (MSFC) in Huntsville manages the program for NASA.

NASA conducts a program of breakthrough research to advance fundamental knowledge on the most important scientific questions about the global and regional integrated Earth system. NASA's program encompasses most themes of the 2003 Strategic Plan for the United States Global Change Research Program (USGCRP).

NASA continues to enhance the ability of the international scientific community to advance global integrated Earth system science using space-based observations. The research encompasses the global atmosphere; the global oceans including sea ice; land surfaces including snow and ice; ecosystems; and interactions between the atmosphere, oceans, land, and ecosystems, including humans. NASA's goal is to understand the changing climate, its interaction with life, and how human activities affect the environment. In association with national and international agencies, NASA applies this understanding for the well-being of society.

NASA aircraft- and surface-based instruments are used to calibrate and enhance interpretation of high-accuracy, climate-quality, stable satellite measurements. NASA supports state-of-the-art computing capability and capacity for extensive global integrated Earth system modeling. NASA, in recording approximately four tetrabytes of data every day, maintains the world's largest scientific data and information system for collecting, processing, archiving, and distributing Earth system data to worldwide users. <http://www.globalchange.gov/agencies/nasa>

2.8.4 Agency Status

Over the next year, the SSO, OSI staff, and the HQ SWG members will continue to broaden knowledge of sustainability, sustainable practices, and the SSPP across the Agency and seek out innovative ideas, concepts, policies, and technologies that could help other agencies meet their sustainability goals.

The status of last year's efforts follows.

- **Partnering Internally to Solve Mutual Risks—Climate Change Impacts & Adaptations** - this effort is still underway. Please see Section 1.5.5 for details on current and future efforts.
- **Improving System Design—Getting Critical Information in the Hands of System Designers** – With the Materials and Processes Technical Information System II (MAPTIS II), a tool to generate a Bill of Material from Computer Aided Design (CAD) drawings will be released in August 2011. This tool extracts the materials and model details directly from the CAD drawing. This process will eliminate the need to extract the information from paper drawings and free up time to verify the correct material selection. Since this tool is embedded within CAD, this process can be completed in real-time and with less user training since it is already in an environment in which users are familiar. Regulations were also added this year: 14 US regulations; 5 international; and 2 industry Lists. Another set of regulations will be released in Q3 2011 and it will have an additional 6-8 regulations.
- **The Use of Communities of Practice and Principal Centers for Spreading Ideas Up, Down, and Across the Agency** – These communities are still active and more information can be found in Sections 1.4.1 and 1.4.2. In 2.8.7, NASA highlights one Principal Center, TEERM.

Future initiatives are addressed in Section 2.8.7, Implementation Methods. NASA recently appointed Center Sustainability Officers at its Centers and anticipates that these individuals and their teams will be great catalysts for promoting sustainability principles at the Centers.

2.8.5 Positions

NASA is currently adequately staffed to meet this goal. Financial resources to execute this goal will come from existing funding sources. No additional funding or staffing is requested.

2.8.6 Planning Table

AGENCY INNOVATION & Government-Wide Support	Units	FY 10	FY 11	FY 12	FY 20
Programs, Projects, Initiatives that support Gov-wide efforts	NA	NA	NA	NA		NA
Other, as defined by Agency	NA	NA	NA	NA		NA

2.8.7 Implementation Methods

The OSI, which is run by NASA's SSO, will be the primary lead for this goal, in cooperation with OSI Divisions and other Offices within NASA such as the ESD.

NASA reviews internal and external sources for ways to advance ideas, policies, methodologies, and technology in order to identify, overcome, and properly manage its long- and short-term mission and institutional risks, and identify opportunities to successfully explore space. Three initiatives, which are currently underway, are highlighted in this plan. These initiatives will enhance the ability of NASA and other agencies to achieve current and future sustainability goals, requirements, and targets.

International Partnerships

By working collaboratively with other nations, NASA is exploring ways to protect natural resources, conserve energy, reduce the use of hazardous materials in space and earthly applications, and reduce GHGs. International partnerships give NASA the opportunity to share its scientific and engineering expertise, stay aware of continually changing international environmental regulations, and understand global markets for materials that NASA uses to accomplish its mission.

NASA is working with an ever-expanding list of international partners, including the European Union, the European Space Agency (ESA), and the nation of Portugal. Our common goal is to foster a sustainable future in which partners continue to explore the universe while protecting our home planet's resources for future generations.

NASA has initiated dialogues with various international entities and participated in international forums on the issue of climate change. NASA activities include a continuing dialogue with representatives of ESA and Centre National d'Études Spatiales (CNES). NASA is currently discussing potential collaborations with ESA on how to mitigate materials obsolescence risks related to rare earth and conflict materials within space system development activities. Additional efforts include comparisons of methods to capture, track, and report sustainability metrics for NASA and ESA. This will allow both agencies and other future participants to share lessons learned and track progress for similar space- and aeronautics-focused organizations.

Further, NASA has sponsored and hosted international events that highlight its activities in the area of adapting to climate change and foster the exchange of information. For example, NASA and the Portuguese Center for Pollution Prevention (C3P) co-sponsor and co-host the International Workshop on Environment and Alternative Energy that includes presentations on climate change impacts and adaptation. Similar events in the past have led to the Portugal Ministry of Defense's evaluation of NASA's encroachment risk identification process at one of their operational air bases to determine ways to mitigate risks to their operations.

An additional example of international collaboration is a project on hexavalent chromium substitution. Hexavalent chromium has been used in corrosion protection coatings and increased awareness of its hazardous properties and the risks to human health and the environment has led to added regulation. Many manufacturers have stopped producing hexavalent chromium-containing products rather than comply with more demanding requirements in the form of US and EU regulation. As a result, the risk of a relied-upon material becoming unavailable is real. In response, NASA, ESA, and aerospace companies have been seeking alternative coating systems able to meet the rigorous performance requirements of aerospace applications. In 2004, in one of its first international environmental collaborative efforts, NASA teamed with several Portuguese entities.

The goal of this joint effort was to identify and test aircraft coating systems that offered many benefits including reduced use of hexavalent chromium. One system satisfactorily passed all laboratory tests and after nearly three years on in-flight testing, the alternative coating system showed no signs of deterioration. The project was funded primarily by the Portuguese partners while NASA funded some laboratory testing and provided project management expertise. The success of this collaboration has led to interest in other joint international efforts.

Using this model, stakeholders can engage experts from around the world while sharing the burden of testing costs, ensuring the safety of workers, and reducing environmentally-driven risks. Finding qualified alternative materials through collaborative testing efforts decreases obsolescence risks for aircraft, spacecraft, rockets, and satellites, and benefits all partners, NASA, the European Space Agency, defense agencies, and airlines.

Increasing Knowledge via Forums and Training Courses

NASA's Academy of Program/Project and Engineering Leadership (APPEL) sponsored one of their "Master with Masters" sessions on Sustainability in Government. Participants included Olga Dominguez, NASA's SSO; Michelle Moore, Federal Environmental Executive, White House Council on Environmental Quality; and Dr. Brian Nattrass, co-founder and managing partner of Sustainability Partners, Inc. This session was conducted at NASA's HQ auditorium and explored issues and challenges related to the implementation of sustainability within a large federal agency. This event was televised and broadcast to the entire NASA community.

APPEL has developed a new course for their program and project management curriculum entitled, "Introduction to Green Engineering." This course was developed in the first half of FY 2011 for NASA engineers, scientists, managers, technicians, and environmental professionals to gain basic knowledge of green engineering and

sustainability, and their applications within NASA projects and missions. Content provided explores ways to employ environmentally conscious designs, materials selection, and manufacturing techniques; and design and develop materials, products, processes, hardware, and systems that are inherently safer, generate less waste, and use energy efficiently. Throughout the course, the participants and instructor exchange ideas on how green engineering and sustainable practices might be implemented within NASA. As an outcome of the first two offerings of this course at MSFC and KSC, NASA will be researching the use of Life Cycle Assessment (LCA) in design and planning of NASA projects. NASA is currently investigating a pilot use of LCA on a significant remediation project to quantify GHG emissions and other environmental impacts of the different remediation options.

In addition to NASA's new green engineering course, NASA personnel will investigate ways to improve awareness of sustainability acquisition within the engineering and program/project community. The vast majority of current NASA contracts are for engineering and technical or research and development services where NASA is not buying products. The HQ SWG will investigate methods to educate the professionals involved in acquisition planning and initiating requirements to include sustainability in every acquisition. This will ensure NASA meets or exceeds targets outlined in section 2.6.1.

The Use of Communities of Practice and Principal Centers for Spreading Ideas Up, Down, and Across the Agency - Technology Evaluation for Environmental Risk Mitigation (TEERM)

As previously mentioned in Section 1.4.2.2, The TEERM Principal Center identifies and validates environmental technologies that enhance mission readiness and reduce environmentally-driven risk to NASA's mission. TEERM projects focus on laboratory or field testing of commercially available replacements for hazardous materials currently used by NASA and commonly involve two or more NASA stakeholders. Three major areas of focus include lead-free solder, coatings for launch structures, and renewable and alternative energy. Individual projects are frequently multi-year.

Lead-Free Solder. Major commercial suppliers of electronics have begun moving away from lead-based solders in their standard products. Unfortunately, using a lead-free component in NASA applications could compromise performance as compared to traditionally used tin-lead solder. Previous work indicates that reworked and mixed solder joints have reduced reliability, but data has been insufficient. Thus, projects in this area focus on the rework of tin-lead and lead-free solder alloys, including the mixing of tin-lead and lead-free solder alloys. Data in this area will help better understand how lead-free electronics will perform in high-reliability applications, thus reducing risks. Data from this project will also be of potential interest to component manufacturers supplying to high reliability markets. TEERM is currently assessing printed wiring boards containing several types of older and newer electronic components and soldering them using lead and lead-free solder. TEERM is also assessing the performance of components after being replaced in an electronic assembly using lead-free solder.

Coatings for Launch Structures. NASA and U.S. Air Force space launch facilities and support equipment are coated with materials to protect them from the harsh effects of corrosion and thermal ablation. The most commonly used coatings contain zinc, volatile organic compounds (VOCs), or isocyanates, which are subject to increasing environmental and safety regulations and concerns. In order to address these compliance needs, more environmentally friendly coatings are being developed. TEERM is teaming with NASA stakeholders and the Air Force on multiple projects to evaluate new coatings that can withstand the extreme temperatures and corrosive exhaust gases from rocket launches, while providing corrosion protection. All alternatives are also being evaluated for environmental impacts. One technology under evaluation is gas dynamic spray technology. Also commonly called cold spray, the technology can be used on a wide variety of substrates with many different materials available. The technology can result in reduced maintenance and hazardous materials/wastes compared to the current processes.

Renewable and Alternative Energy. One TEERM project is evaluating concentrated solar air conditioning for buildings to demonstrate if parabolic solar collectors can be readily integrated with industrial-sized absorption chillers to provide a renewable energy source for air conditioning. This would enable NASA to meet targets outlined in this SSPP by providing reliable access to affordable, stable energy supplies, with a small footprint. TEERM is also in the initial investigation stage of evaluating bird and bat presence at NASA sites under consideration for wind turbine installations. This enables NASA to obtain the required permits for its suitable sites and determine if emerging detection technologies can be utilized effectively at NASA sites such as WTSF, WFF, and GRC, and other government partners such as the US Geological Survey, National Renewable Energy Laboratory, and US Army.

2.8.8 Return on Investment

No significant projects or initiatives included in the previous year's SSPP have been deliberately cancelled or suspended due to a lower than expected ROI. Likewise, no specific projects or initiatives have been expanded due to higher than expected ROI.

Section 3: Agency Self Evaluation

As requested, NASA provides 'yes' or 'no' answers to the following questions regarding critical aspects of the Plan and provides explanations when necessary.

Does your Sustainability Plan incorporate and align sustainability goals, GHG targets and overarching objectives for sustainability with the Agency Strategic Plan?	Yes
Does it provide annual targets, strategies and approaches for achieving the 2015 and 2020 goals?	Yes
Is the Sustainability Plan consistent with the FY2012 President's Budget?	No (*)
Does the Sustainability Plan integrate all statutory and Executive Order requirements into a single implementation framework for advancing sustainability goals along with existing mission and management goals, making the best use of existing and available resources?	Yes (**)
Does your plan include methods for obtaining data needed to measure progress, evaluate results, and improve performance?	Yes

* Regarding the SSPP goals and the President's FY2012 Budget, NASA's 2011 SSPP was updated in the April-May 2011 timeframe. Over the last two years, NASA planned a significant increase in its capital investments for facilities that would help reduce energy and water consumption, greenhouse gas emissions, unsustainable commuting habits, and ensure that facilities are resilient to likely impacts of climate change. This increase was reflected in NASA's FY11 budget. Unfortunately, NASA is currently evaluating and planning for a \$1B decrease (reflected in the President's FY2012 budget) in capital investments since it is not supportable in the current budget environment. NASA will be investigating ways to scale back planned activities to renew, consolidate, and reduce the consequences of its activities on the natural environment.

** NASA strives to comply with all statutes and Executive Orders relating to energy and the environment, including the Clean Air Act, Clean Water Act, Threatened and Endangered Species Act, the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Environmental Policy Act, EO 13423 relating to the use of Environmental Management Systems, etc. Executive Order 13514 does not reference *all* environmental statutes and executive orders, though many are either referenced or implied. A NASA-initiated sustainability plan might include other provisions and aspects than those specified in EO 13514. In addition, while the SSPP provides an implementation framework for most NASA provisions relating to energy and the environment, other NASA management plans, including NASA Policy Directives and NASA Procedural Requirements, contain the more detailed execution steps necessary to achieve the goals articulated in the SSPP. The SSPP, following the directions from OMB and the CEQ, nonetheless serves as a helpful reference document that consolidates most goals relating to energy and the environment.

Other Key Questions for 2011:

1. Did your agency meet by 12/30/10 due date and/or is it now able to demonstrate comprehensive implementation of the EO 13423 Electronic Stewardship goals?

- Acquire at least 95% EPEAT-registered electronics
- Enable energy star or power management features on 100% of eligible PCs
- Extends the life and/or uses sound disposition practices for its excess or surplus electronics

Answer - Yes, NASA met its Electronic Stewardship goals by 12/30/10.

2. Is your agency tracking and monitoring all of its contract awards for inclusion of requirements for mandatory federally-designated green products in 95% of relevant acquisitions?

Answer – Yes, NASA has implemented a strategy to use data from the Federal Procurement Data System to monitor 5% of its eligible contract actions as a sample to determine compliance with SSPP Goal 6 - Sustainable Acquisition. We are also implementing additional requirement review processes to examine opportunities for inclusion of environmentally preferable products and services. [Please see section 2.6.6 for current activities; section 2.6.4 for future activities.]

3. Has your agency completed energy evaluations on at least 75% of its facilities?

Answer – To be determined. NASA is currently gathering facilities level data from the ten NASA centers and installations. This data will be available for analysis by the end of June when NASA will know if the 75% target has been met.

4. Will your agency meet the deadline of October 1, 2012 (EPACT'05 Sec 103) for metering of energy use?

Answer - No, NASA will not meet the deadline for metering electrical use by October 1, 2012. While NASA has been on a steady path to meet this goal since 2006, NASA will have metered approximately 85% of all facilities appropriate for electrical metering. In FY 2011, funding identified for electrical metering was diverted for NASA HQ operations and other Agency cross-cutting needs.

5. If your agency reports in the FRPP, will it be able to report by December 2011 that at least 7% of its inventory meets the High Performance Sustainable Guiding Principles?

Answer - No, at least 7% of the Real Property Inventory will not meet the Sustainable Guidelines by the time the FRPP is to be submitted in December 2011. Within the next six months, the NASA Facilities Engineering Division and the Technical Capabilities and Real Property Management Division plan to update the Real Property Management System (RPMS) in order to reconcile the sustainable building baseline to include 1) all leased property and 2) buildings larger than 5,000 sf and smaller than 10,000 sf. The original baseline did not include facilities that met these two conditions.

Appendices

Appendix 1 - Agency Climate Change Adaptation Policy Statement

Appendix 2 - Acronyms and Abbreviations

Appendix 3 – Referenced Documents

Appendix 4 – Definitions

APPENDIX 1 - AGENCY CLIMATE CHANGE ADAPTATION POLICY STATEMENT**NASA Policy Statement
Adapting to a Changing Climate**

Scientific evidence continues to mount that the Earth's climate is changing. While the scope, severity and pace of climate impacts are difficult to predict, it is clear that climate variability and climate change could have important impacts on NASA's ability to fulfill its mission and thus merits a proactive and integrated response. NASA's goal is climate resilient NASA Centers. Recognizing that each Center offers vital products, services and corporate knowledge, NASA's policy is to apply NASA's scientific expertise and products so that we can incorporate climate information into our decision-making and planning, create innovative, sustainable and flexible solutions, and share best practices.

To implement this policy, NASA commits to:

- Undertake climate adaptation¹ planning and apply the best science expertise and information available.
- Apply the “guiding principles”¹⁶ and planning “flexible framework”¹ for climate change adaptation developed by the Interagency Climate Change Adaptation Task Force.
- Integrate climate adaptation planning and actions into agency programs, policies and operations.
- Consider potential climate impacts in long-term planning, setting priorities for scientific research and investigations, and making decisions affecting the agency resources, programs, policies, and operations.
- Develop an agency-wide adaptation plan.
- Coordinate with other agencies and interagency efforts, nationally and internationally, on climate change adaptation issues, and share climate change adaptation planning information with the world.

Successful execution of this policy relies on NASA Center support – the place where NASA's operations and mission are accomplished. Center commitment will be necessary to analyze how climate change may impact its ability to achieve its mission, policy, program, and operation goals by reviewing existing programs, operations, policies, and authorities to:

- Identify potential impacts of climate on the installation's area of responsibility
- Prioritize and implement response actions and coordinate with local efforts

¹⁶ Found in Progress Report of the Interagency Climate Change Adaptation Task Force (October 5, 2010) at URL: <http://www.whitehouse.gov/sites/default/files/microsites/ceq/Interagency-Climate-Change-Adaptation-Progress-Report.pdf> <accessed 21 April 2011>

- Continuously assess and improve capacity to adapt to present and future changes in the climate.

Successfully adapting to a changing climate requires active participation by the people responsible for implementing efforts and activities, as experienced by NASA climate scientists while working with multiple city officials in their adaptation planning efforts. A NASA Headquarters Advisory Council on Climate Adaptation already exists with members from NASA's Office of Strategic Infrastructure (OSI) and Science Mission Directorate (SMD). This policy designates the Center Sustainability Officers (CSOs) as the persons who will coordinate Center adaptation activities with the Agency's Senior Sustainability Officer, the senior Agency official responsible for implementing the required climate change adaptation planning actions.

NASA climate scientists have already prepared historic and projected climate information for each of NASA's Centers and NASA OSI and SMD will sponsor two Center-level climate impact and adaptation workshops by the end of calendar year 2012. NASA will continue to support climate assessment activities through its annual SMD Research Opportunities in Space and Earth Sciences (ROSES) grants, which will be open for participation by the full scientific community. Additional efforts through international partnerships and STEM are also anticipated in the next 18 months.

It is NASA's intent to formalize its policy on climate change adaptation (and sustainability) within an existing NASA Procedural Directive (NPD) - 8500, Environmental Management. The revised NPD would be signed by NASA's Administrator and align with NASA's governance structure.



signed 5/18/11

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NASA Senior Sustainability Officer

APPENDIX 2 - ACRONYMS AND ABBREVIATIONS

AA	Assistant Administrator
AFV	Alternative Fueled Vehicle
ARM	Active Risk Management
ARRA	American Reinvestment and Recovery Act
BTU	British Thermal Unit
C&D	Construction and Demolition
CASI	Climate Adaptation Science Investigator
CAD	Computer Aided Design
CEQ	Council on Environmental Quality
CFL	GSA's Computer for Learning
CGT	Center Green Teams
CIO	Chief Information Officer
CoF	Construction of Facilities
CRM	Cultural Resources Management
CSO	Center Sustainability Officer
CSWG	Center Sustainability Working Group
DM	Deferred Maintenance
DMA	Deferred Maintenance Assessment
DOE	Department of Energy
DOT	Department of Transportation
ECIC	Engineering Construction Innovations Committee
ECR	Environmental Compliance and Restoration Program
EEP	Energy Efficiency Panel
EEFR	Environmental & Energy Functional Review
EISA	Energy Independence & Security Act of 2007
EMD	Environmental Management Division
EMS	Environmental Management System
EO	Executive Order
EPA	Environmental Protection Agency
EPAct	Energy Policy Act of 2005
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
ESD	Earth Science Division
ESH	Environmental, Safety, and Health
ESPC	Energy Savings Performance Contract
EU	European Union
EUL	Enhanced Use Lease
EWMFR	Energy and Water Management Functional Review
FAR	Federal Acquisition Regulation
FAST	Federal Automotive Statistical Tool
FEMP	Federal Energy Management Program
FED	Facilities Engineering Division
FPDS	Federal Procurement Data System
FRPP	Federal Real Property Profile
FTE	Full Time Equivalent
FY	Fiscal Year
gal	Gallon
GHG	greenhouse gas
GGE	gasoline gallon equivalent
GSA	General Services Administration
HVAC	Heating, Ventilating and Air Conditioning
I3P	Information Technology Infrastructure Integration Program
ISO	International Organization for Standardization
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KSC	Kennedy Space Center

KW	kilowatt
LEED®	Leadership in Energy and Environmental Design
LSEV	Low speed electric vehicle
MAPTIS-II	Materials and Processes Technical Information System II
MMTCO_{2e}	Million Metric Tons of Carbon Dioxide Equivalent
MOBLAS	Mobile Laser Site
MRR	EPA's Mandatory Greenhouse Gas Reporting Rule
MSC	Mission Support Council
MtCO_{2e}	Metric Tons of Carbon Dioxide Equivalent
MWh	megawatt hours
NASA	National Aeronautics and Space Administration
NECPA	National Energy Conservation Policy Act
NEPA	National Environmental Policy Act
NETS	NASA Environmental Tracking System
NODIS	NASA Online Directives Information System
NPD	NASA Policy Directive
NPR	NASA Procedural Requirement
O&M	Operations and Maintenance
ODIN	Outsourcing Desktop Initiative for NASA
OFEE	Office of the Federal Environment Executive
OMB	Office of Management and Budget
OMFIT	Operations & Maintenance of Facilities Innovations Team
OSI	Office of Strategic Infrastructure
PIC	Procurement Information Circular
PDM	Product Data Management
PLM	Project Life-Cycle Management
PMR	Procurement Management Reviews
PPBE	Programming, Planning, Budgeting, and Execution
PUE	Power Utilization Effectiveness
PV	Photovoltaic
R2	Responsible Recyclers
REC	Renewable Energy Certificate
ROI	return on investment
RPI	Real Property Inventory
RPMS	Real Property Management System
RRAC	Regulatory Risk Analysis and Communication (Principal Center)
RSA	Recycling and Sustainable Acquisition (Principal Center)
SBIP	Sustainable Building Implementation Plan
sf	square feet or square foot
SII	Strategic Institutional Investment
SMD	Science Mission Directorate
SSO	Senior Sustainability Officer
SSPP	NASA's Strategic Sustainability Performance Plan
SSWG	Strategic Sustainability Working Group
STEM	Science, Technology, Engineering and Mathematics
T&D	Transmission & Distribution
TBD	To Be Determined
TC&RPMD	Technical Capabilities & Real Property Management Division
TEERM	Technology Evaluation for Environmental Risk Mitigation (Principal Center)
UESC	Utility Energy Service Contract
USGBC	US Green Building Council
VLBI	Verylong Baseline Interferometry Site
VURB	Vehicle Utilization Review Boards
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

APPENDIX 3 - REFERENCED DOCUMENTS

Title	URL
2011 NASA Strategic Plan	http://www.nasa.gov/pdf/516579main_NASA2011StrategicPlan.pdf
National Aeronautics and Space Act of 1958	http://history.nasa.gov/spaceact.html
NASA's Ames Research Center Greenspace Initiative	http://www.nasa.gov/centers/ames/greenspace/
NASA Online Directives Information System (NODIS Library)	http://nodis3.gsfc.nasa.gov/
NASA Open Government Plan	http://www.nasa.gov/open/plan/
NASA PIC 01-27, "Applicability of Affirmative Procurement."	http://www.hq.nasa.gov/office/procurement/regs/pic01-27.html
NASA PIC 08-04, "Environmental Reporting,"	http://www.hq.nasa.gov/office/procurement/regs/pic08-04.html
NPD 8500.1B—NASA Environmental Management	http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PD_8500_001B_&page_name=main&search_term=%208500
NPR 8530.1A—Affirmative Procurement Program and Plan for Environmentally Preferable Products	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8530&s=1A
NPR 8553.1B—NASA Environmental Management System	http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_8553_001B_&page_name=main
NPR 8570.1—Energy Efficiency and Water Conservation w/Change 2 (4/04/08) REVALIDATED	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8570&s=1
NPD 8800.14D —Policy for Real Estate Management (Revalidated, October 14, 2009)	http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PD_8800_014D_&page_name=main
NPR 8800.15B – Real Estate Management Program	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8800&s=15B
NPD 8810.2A—Master Planning for Real Property	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8810&s=2A
NPR 8810.1—Master Planning Procedural Requirements	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8810&s=1
NPD 8820.2C—Design and Construction of Facilities	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8820&s=2C
NPR 8820.2F—Facility Project Requirements	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8820&s=2F
NPR 8831.2E—Facilities Maintenance and Operations Management	http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8831&s=2E
EISA 2007 (The Energy Independence and Security Act of 2007)	http://energy.senate.gov/public/index.cfm?FuseAction=IssueItems.Detail&IssueItem_ID=f10ca3dd-fabd-4900-aa9d-c19de47df2da&Month=12&Year=2007

Title	URL
Federal Acquisition Regulation (FAR), Part 23	https://www.acquisition.gov/far/current/html/FARTOCP23.html#wp227606
Climate Change Adaptation in New York City: Building a Risk Management Response	http://onlinelibrary.wiley.com/doi/10.1111/nyas.2010.1196.issue-1/issuetoc
Progress Report of the Interagency Climate Change Adaptation Task Force (Released October 5, 2010)	http://www.whitehouse.gov/sites/default/files/microsites/ceq/Interagency-Climate-Change-Adaptation-Progress-Report.pdf

APPENDIX 4 - DEFINITIONS

Absolute Greenhouse Gas Emissions—total GHG emissions without normalization for activity levels and includes any allowable consideration of sequestration.

Alternative Fuel Vehicle—vehicles defined by section 301 of the Energy Policy Act of 1992, as amended (42 U.S.C. 13211), and otherwise includes electric fueled vehicles, hybrid electric vehicles, plug-in hybrid electric vehicles, dedicated alternative fuel vehicles, dual fueled alternative fuel vehicles, qualified fuel cell motor vehicles, advanced lean burn technology motor vehicles, self-propelled vehicles such as bicycles and any other alternative fuel vehicles that are defined by statute.

Construction and Demolition Materials and Debris—materials and debris generated during construction, renovation, demolition, or dismantling of all structures and buildings and associated infrastructure.

Device Types—electronic products listed under the Energy Star program that NASA is required to purchase or lease. "Computers and Electronics" section in the EPA Energy Star site contains the list of targeted products. This includes products with stand-by power. This does not include Energy Star products that are not "Electronics" such as lighting, appliances, roof products, windows, etc.

Divert and Diverting—redirecting materials that might otherwise be placed in the waste stream to recycling or recovery, excluding diversion to waste-to-energy facilities.

Electronic Assets—electronics products owned and leased by the Agency that are disposed following any of the acceptable end-of-life practices.

Eligible Electronics Products—computers, laptops, monitors, imaging equipment (e.g., copiers, faxes, printers, scanners) and hand-held devices (e.g., Blackberries, cell phones) that have power management and other environmental and energy features.

Energy Intensity—energy consumption per square foot of building space, including industrial or laboratory facilities.

Environmental—environmental aspects of internal Agency operations and activities, including those aspects related to energy and transportation functions.

Excluded Vehicles and Equipment—any vehicle, vessel, aircraft, or non-road equipment owned or operated by an agency of the Federal Government that is used in combat support, combat service support, tactical or relief operations, or training for such operations; Federal law enforcement; emergency response; or spaceflight vehicles (including associated ground-support equipment).

Greenhouse Gases—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Renewable Energy—energy produced by solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project.

Scope 1—direct GHG emissions from sources that are owned or controlled by the Federal agency.

Scope 2—direct GHG emissions resulting from the generation of electricity, heat, or steam purchased by a Federal agency.

Scope 3—GHG emissions from sources not owned or directly controlled by a Federal agency but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting.

Sustainability and Sustainable—to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations.

Water consumption intensity—water consumption per square foot of building space.

Zero-net-energy building—a building that is designed, constructed, and operated to require a greatly reduced quantity of energy to operate, meet the balance of energy needs from sources of energy that do not produce GHGs, and therefore result in no net emissions of GHGs and be economically viable.

Cover photos, from left to right:

- Hubble Space Telescope about to be released from the cargo bay of the Atlantis Shuttle in 2009
- Experimental solar sails designed to use sunlight for propulsion into deep space
- NASA scientists assessing impacts of climate change on the Arctic Pacific environment
- Testing the 21-foot wingspan 8.5 percent scale prototype of a blended wing body aircraft